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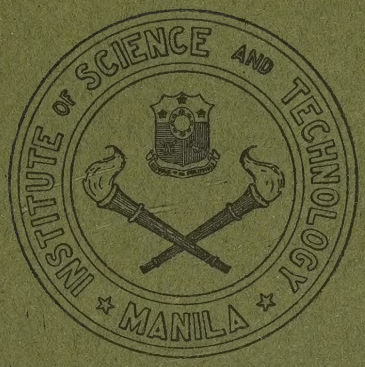
# THE PHILIPPINE JOURNAL OF SCIENCE

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THE PHILIPPINE
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VOL. 84 JUNE, 1955 NO. 2

# NEW PHILIPPINE FERNS, XI

BY EDWIN B. COPELAND
*University of California, Berkeley, California*

TWO PLATES

**CYCLOSORUS POLYPTERUS Copel., sp. nov.**

C. stipite usque ad auriculas infimas 15–20 cm alto, auriculas amorphas ca 8; pinnis ca 60 paribus, sessilibus, maximis 14 cm longis, acuminatis. ½ ad costam incisis, falcatis, 2 mm latis; venis anastomosantibus volgo 3, venis facie inferne ubique praestantisnus, margine setis et enim paucis sporis medialibus ca 6; indusio persistente.

NEGROS, Mt. Canlaon, alt. 650 m, *Philip. Nat. Herb. 12373 G. E. Edaño.*

A near and obvious relative of *C. magnus* from the same mountain. The chief distinction is the setæ on the veins of *C. polypterus.*

**STENOSEMIA DIMORPHA, Copel., sp. nov.** **Plate 1.**

S. rhizomate lignoso, paleis nigro-fuscis sparso; frondium sterilium stipitibus 15 cm altis superne sulcatis, paleis linearibus deciduis ornatis, lamina 35 cm alta, pinnata, parte tertia apicale lobata; pinnis erecto-patentibus 6 cm longis 25 mm latis, acutis, basi truncatis, lobatis lobis inferioribus 2 mm longis, in sinubis dentibis praeditis, glabris, venis anastomosantibus; frondium fertilium stipitibus 30 cm altis, lamina 20 cm alta, pinnis, oppositis 3 cm longis, 2 mm latis, acutis, sporangiis faciem inferiorem complentibus.

NEGROS, Negros Occidental, Kinabkaban River, Canlaon Volcano, alt, 650 meters, along forested ridge; *Philip. Nat. Herb. 21388 G. E. Edaño.*

If one were to judge by the sterile frond, this species would be placed in *Heterogonium.* The complete dimorphism characterizes *Stenosemia* but I place it in this genus primarily because it is the older of the two.

**LOMAGRAMMA CORDATA Copel., sp. nov.** **Plate 2.**

L. rhizomate scandente, 1 cm crasso, rugoso, paleaceo paleis castaneis tenuibus lanceolatis; stipite 8–12 cm alto, sparsius paleaceo; frondibus 80 cm longis, dimorphis, pinnatis; pinnis sterilibus sessilbus, maximis 12 cm longis, 7 mm latis, falcato-acuminatis, oblique cordatis, integris, herbaceis, costis et sparsissime laminis paleaceis; pinnis fertilibus 10–14 cm longis, basi utroque lobo uno praeditis, alibi anguste linearibus pedicellis 4–6 cm longis.

BILIRAN, on ridge in mossy forest, alt. 1,000 meters, *Philip. Nat. Herb. 20277 M. D. Sulit.*

Bathyphylls are unknown. Sterile aceophylls are narrower than in any other species, their pinnæ thin, brownish, because of the minute paleæ entire, acuminate, the bases cordate on both sides, the areolæ in two irregular rows.

**CYATHEA ARBORESCENS Copel., sp. nov.**

C. tripinnatifida pinnis, 40–50 cm longis, pedicellis pinnarum infimarum 15 mm longis caeteris nullis, achillis spinulis minutis et paleis perpaucis ornatis segmentis acutis, rachilla superiore minute velutina inferne squamulis paucis bullatis obtusis; soris costalibus, indusiis mox delapsis.

NEGROS, Mt. Canlaon, alt. 1,100 m, "along forested ridge," *Philip. Nat. Herb. 21426 G. E. Edaño.*

The upper surface is blackish-green, the nether one olive-green, the pinnules are uniformly closely acute.

**CYATHEA BILIRANENSIS Copel., sp. nov.**

Arbor parva 2½ m alta. stipite 30 cm alto, 6 cm crasso, basi nigro-fusco, ubique spinis acutis obsito, lamina tripinnatifida; pinnis infimis 7 cm longis 4 cm latis, pinnis sequentibus valde remotis subsessilibus pinnis majoribus 30 cm longis 10 cm latis. rhachi superiore glabra, inferiore prope rhachin paleolis bullatis ornatis, soris costalibus, indusio mox fugitivo.

BILIRAN, alt. 640 m, *Philip. Nat. Herb. 20242 M. D. Sulit.*

**MACROGLENA OBTUSA Copel., sp. nov.**

M. rhizomate repente 2 mm crasso, setis nigris sparse; stipite 10 cm alto, fusco, glabrescente, fere ad rhizoma lineas dos laminares angustissiman ornato, lamina 25 cm alta 10 cm lata, quadripinnatifida, pinnis sessilibus, 3 cm latis; obtusis vel subactis, rachillis et segmentis, ca. 0.5 mm latis, cellulis paullo elongatis lateribus opacis; involucrus tubiformibus 2 mm longis vix 1 mm latis, exalatis, ore paillo dilatatis, receptaculo leviter extruso.

NEGROS, Negros Occidental, Mt. Canlaon, Kinabkaban River, alt. 600 m, *Philip. Nat. Herb. 21369 G. E. Edaño.*

In gross appearance, most like *M. flavo-fusca,* but with less acute pinnæ and larger and more involucre. The lateral walls are opaque, and I can not decide whether they are coarsely pitted or get their appearance from the accumulation of the contents against the walls.

# ILLUSTRATIONS

PLATE 1. *Stenosemia dimorpha* Copel., sp. nov., type.
2. *Lomagramma cordata* Copel., sp. nov., type.

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PLATE 1.

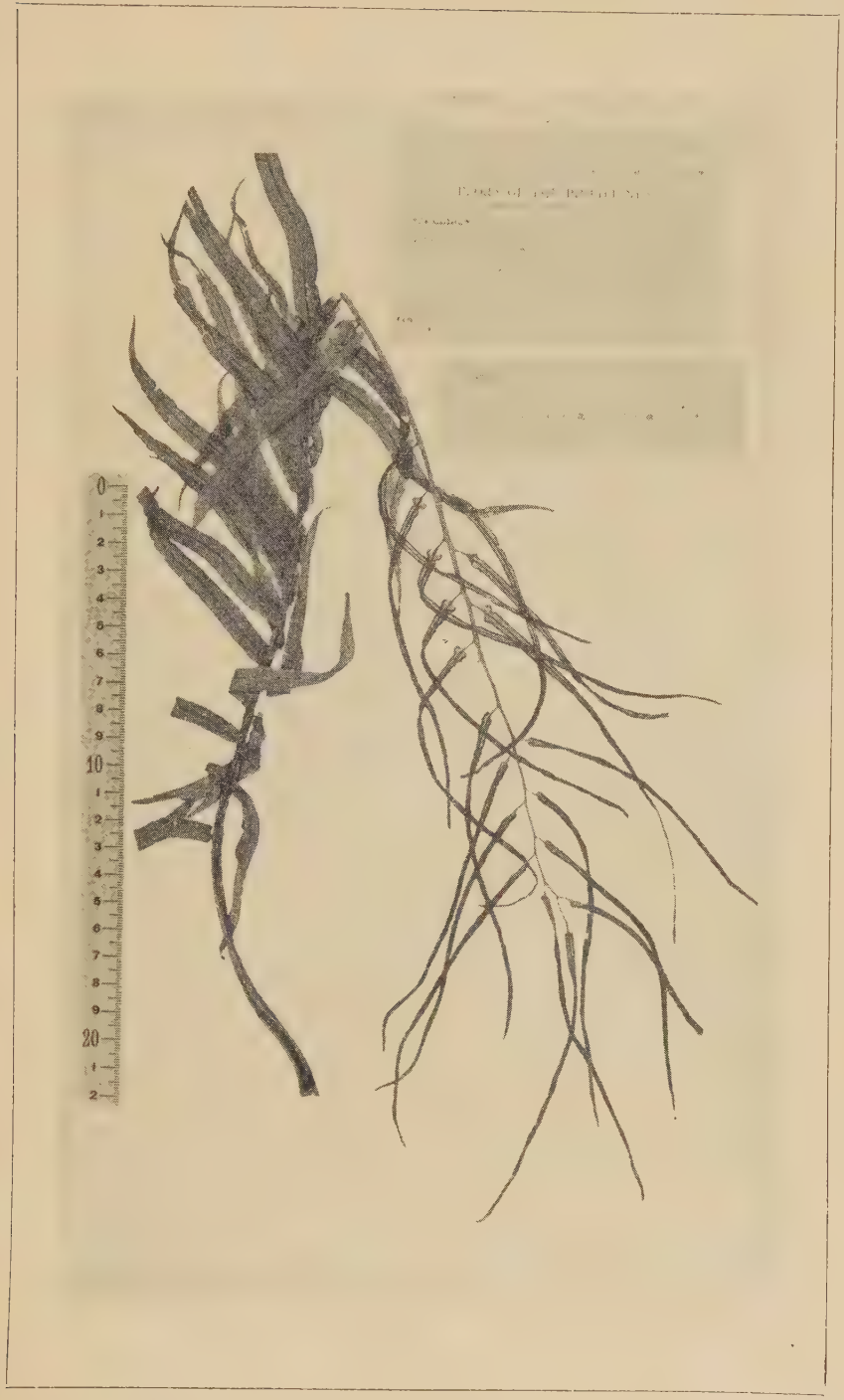


PLATE 2.

# PHILIPPINISCHE LEUCOSYKE-ARTEN AUS DEM PHILIPPINE NATIONAL HERBARIUM

Von M. Unruh
*Hannover, Deutschland*

**LEUCOSYKE ANGUSTA M. Unruh, sp. nov.**

Ramuli teretiusculi apicem versus ± applanati brunneo- vel ferrugineo-tomentosi dense adpresse vel et subadpresse albido-pilosi. Stipulæ maiusculæ demum deciduæ dorso ferrugineo-tomentosæ dense minutissime adpresse albido-pilosulæ in costis et patenter albido-pilosulæ. Folia anisopetiolata mediocria. Lamina ± manifeste inæquilatera elliptica vel oblongo-elliptica, acuminata, basi obtusa interdum angustior raroque rotundata, supra basim integram regulariter dentato-serrata, superne dense minutissime adpresse albido-strigillosa remoteque hispidula, subtus in nervis venisque brunneo-tomentosis albido-villosiuscula glabrescens. Nervi laterales utrinque 5–8. Venæ internæ ascendentes externæ numerosiores singula vena interna sæpe cum duabus aut tribus vel et pluribus externis angulatim conjuncta vel rarius cum una vena externa in venam quasi simplicem angulatem vel subarcuatam confluens.

Dioica. Inflorescentiæ fem. maiusculæ longiuscule pedunculatæ masc. non visæ. Flores fem. subsessiles perianthium breviusculum subpellucidum 5-lobum, lobis apice glandulosociliolatis.

Polilio, Anibawan, along bank of Anibawan River, sea level. Tree, 5 m high; diameter, breast high, 4 cm. ♀, fruit dark-green. *Philip. Nat. Herb. 6480 A. P. Castro* and *P. Añonuevo,* November 28, 1948. (Typus Arnold Arb. Herb.)

Die Pflanze erinnert in der Blattnervatur, in ihren ziemlich grossen laubigen, dem unbewaffneten Auge fast kahl erscheinenden Stipeln und den recht grossen weiblichen Köpfchen an die in Leyte und Mindanao vorkomende *L. nivea* C. B. Rob., von der sie offenbar eine schmalblattrige nördliche Verwandte ist. *L. nivea* hat breitere eiförmige Blätter, die ausserdem grosser sind als bei der neuen Art.

**LEUCOSYKE BENGUETENSIS M. Unruh.***

Luzon, Mountain Province, Mt. Nañgaoto, open place in pine forest below km 61, alt. 2,000 m. Tree, 2 to 3 m high; ♂, flower

* Unruh, M. Monographic der Gattung *Leucosyke* Zoll. et Mor. Bot. Jahrb. pt. 3 73 (1943) 191–258, *Pl. 23–25, figs. 1–2.*

pinkish-brown. *Philip. Nat. Herb. 7737 M. D. Sulit* and *M. Celestino,* February 15, 1948. An diesem und dem folgenden Exemplar befindet sich an den Zweigen, den Blattstielen und der Nervatur der Blattunterseite eine abstehende Behaarung, die in meiner Artdiagnose nicht erwahnt wird. Sie verkahlt aber, wie man an *Philip. Nat. Herb. 7737* sehen kann, ausserordentlich leicht.

Mt. Data, wooded gulley in pine forest, alt. 1,800 m. Tree, 8 m high; diameter, breast high, 5 cm. ♂, flower pink. *Philip. Nat. Herb. 1855 G. L. Alcasid,* April 1, 1946. Dieses Exemplar hat grössere Blätter, die leider stark beschädigt sind. Neben anderen Blättern, deren Nervatur der Beschreibung in meiner Artdiagnose entspricht, findet sich eines, (ebenfalls beschädigt) bei dem der unterste Seitennerv etwa in der Spreitenmittee inseriert ist, darauf folgt ein weiterer auf der gleichen Seite.

**LEUCOSYKE BRUNNESCENS C.B. Rob. var. EUBRUNNESCENS M. Unruh.**

LUZON, Mt. Province, Kiasan, Lubuagan, Kalinga. In thick secondary growth bank of stream, alt. 824 m. Small tree 3 to 4 m high; diameter, breast high, 8 cm. ♀, fruit green. *Philip. Nat. Herb. 7871 M. Celestino,* April 29, 1948.

**LEUCOSYKE CAPITELLATA (Poir.) Wedd. var. EU-CAPITELLATA M. Unruh.***

LUZON, Tayabas (Quezon) Province: Baler, Ditomabo, alt. 250 m. Tree, 4 to 7 m high, ♀, fruit green. *Philip. Nat. Herb. 2430 E. Quisumbing,* May 5, 1947.

Laguna Province, Makiling National Park, along road, vicinity of mud spring, alt. 350 m. Tree, 4 to 5 m high, ♂, flower pinkish. Special notes: This species of *Leucosyke* has pinkish inflorescence while others growing nearby have greenish infl. *Philip. Nat. Herb. 8527 M. D. Sulit,* May 21, 1947. Das gesammelte Exemplar ist männlich. Handelt es sich bei den nahebei wachsenden Pflanzen mit grünen Infloreszenzen vielleicht um weibliche Pflanzen?–Weiteres in der Notiz zu dem folgenden Stück. Makiling National Park, vicinity of spring near road, second camp, alt. 700 m. Tree, stocky, 4 to 5 m high, ♀. Special notes: This is the species of *Leucosyke* found on high altitude, *Philip. Nat. Herb. 8530 M. D. Sulit,* May 17, 1947. Dieses Exemplar fallt auf durch seine Blattmerkamale: Die Blätter sind eng zugespitzt, manchmal ist die breiteste Stelle der Spreite dem Grunde stärker genähert. Die Sägung des Randes ist kaum ausgeprägt. Die deutlich hervortretende Queraderung ist sehr eng, die Seitennerven sitzen höher an, wodurch ihre Zahl geringer

wird. Zwischen dieser extremen Gesamtkombination der Blattmerkmale und den Merkmalen einer typischen var. *eu-capitellata* var. *eucapitellata* vermittelt das zuvor aufgezahlte Stück (*Philip. Nat. Herb. 8527*), das ebenfalls im Makiling National Park gesammelt ist. Auch bei dieser Pflanze ist die Aderung eng, aber die Sägung des Blattrandes deutlicher, und die Seitennerven sitzen tiefer an. Die Blätter sind, soweit man das noch erkennen kann, ebenfalls eng zugespitzt, die Spreitenform ist der einer typischen var. *eucapitellata* ähnlicher. Die Angabe des Sammlers, dass sein Stück die *Leucosyke*-Art sei, die in höheren Lagen vorkommt, soll sich wahrscheinlich auf die Verhältnisse in der Umgebung seines Fundortes beziehen. Andere Arten sind in entsprechender oder noch grösserrer Seehöhe gesammelt worden (vgl. *L. brunnescens* var. *eubrunnescens, Philip. Nat. Herb. 7811 M. Celestino,* die in 824 m, und *L. benguetensis, Philip. Nat. Herb. 7737 M. D. Sulit* and *M. Celestino,* die in 2,000 m Höhe eigebracht worden ist).

MINDORO, sitio Bugayan, Baco (nach den Herbarzettel: Mt. Halcon), along stream in forest, alt. 500 m. Tree, 5 m high; diameter, high, 4 cm. ♀, fruit green. *Philip. Nat. Herb. 3232 G.E. Edaño,* March 10, 1948.

SAMAR, Kadapnan, Bo. Bantayan, Oras, primary forest, alt. 100 m. Tree, 7 m high; diameter, breast high, 5 cm.–♀, fruit green. *Philip. Nat. Herb. 5762 A. Castro* and *P. Añonuevo,* May 16, 1948; same locality, tree, 3 m high; diameter, breast high, 3 cm. ♂, fruit green. *Philip. Nat. Herb. 5710 A. Castro* and *P. Añonuevo,* May 6, 1948; sitio Tanané, Loquilocon, Wright, open place, vicinity of km 42, alt. 100 m. Tree, 5 m high; diameter, 6 cm. ♂, flower white. *Philip. Nat. Herb. 6166 M. D. Sulit* and *E. Conese,* May 13, 1948.

NEGROS, Negros Oriental Province, Cuernos de Negros, Lipayo River, along ridge in forest slope, alt. 1,066 m. Height of plant, 6 m; diameter, high, 4 cm.–♀, fruit brown (das gesammelte Stück ist mannlich). *Philip. Nat. Herb. 7249, G. E. Edaño,* June 13, 1948; Cuernos de Negros, Matangiva River, along ridge in forested slope, alt. 700 m. Height of plant, 8 m; diameter, 5 cm. ♂, fruit green (das gesammelte Exmplar ist mannlich). *Philip. Nat. Herb. 7407 G. E. Edaño,* May 15, 1948.

TAWITAWI. Ohne naheren Fundort. *Philip. Nat. Herb. 7429 G. L. Alcasid* and *M. Celestino,* ♀, June, 1940.

**LEUCOSYKE CAPITELLATA (Poir.) Wedd. var. CELTIDIFOLIA (Gaud.) Wedd.**

LUZON, Batangas Province, Sitio Bunga, Bo. Biga, Mt. Lobo, alt. 350 m. Tree, 5 to 6 m high; diameter, 15 cm. ♀, fruit greenish. *Philip. Nat. Herb. 8562 M. D. Sulit,* October 28, 1946.

**LEUCOSYKE CAPITELLATA (Poir.) Wedd. var. FALCATA (Bl.) Wedd.**

NEGROS, Negros Oriental Province, Cuernos de Negros, Masaplad River, along ridge in forest, alt. 400 m. Height of plant, 8 m, diameter, 4 cm. ♀, fruit green. *Philip Nat. Herb. 7284 G. E. Edaño,* May 8, 1948. Bei den langen ungleichseitigen Blättern dieses Exemplars ist teilweise sogar die Mittelrippe bogenförmig gekrummt. Die Streckung der Blätter scheint am Spross von unten nach oben hin zuzunehmen. An dem einen Zweige befindet sich unten ein Blatt, das bei 4.3 cm grosster Breite etwa (die Spitze ist hier beschädigt) 11 cm Spreitenlänge hat; bei einen Blatt von der Spitze des gleichen Sprosses betragt die Länge der Spreite 15 cm. Ein weiteres Blatt von einen anderen Spross der gleichen Pflanze misst bei 4.5 cm grösster Breite 20 cm Spreitenlänge. Cuernos de Negros, Matangiva River, along ridge in forested slope, alt. 700 m. Height of plant, 7 m; diameter, 4 cm. ♀, fruit green (der gesammelte Zweig ist mannlich.). *Philip. Nat. Herb. 7415 G. E. Edaño,* May 16, 1948. An diesem Exemplar ist das *falcata*-Hauptmerkmal nicht so deutlich ausgeprägt wie an dem vorigen, dem es aber in der fangen Zuspitzung seiner Blätter sehr ähnlich ist. Man erkennt Uebereinstimmung und Unterschiede am besten, wenn man die beiden Exemplare etwa mit *Philip. Nat. Herb. 7407* zusammenhält. Das letztgenannte Stück, das ich als var. *eucapitellata* bestimmt habe, ist anscheinend gans in der Nähe von *Philip. Nat. Herb. 7415* gesammelt worden, wie aus den Angaben des Sammlers hervorgeht. Es ist darum nicht ausgeschlossen, dass es sich bei dem zweiten, heir als var. *falcata* bestimtem Stück um einen Bastard zwischen einer reinen var. *falcata* (heir repräsentiert durch *Philip. Nat. Herb. 7284*) und einer var. *eucapitellata* handelt. Im übrigen scheinen, wenn man so wenige Angaben bereits verallgemeinern darf, die beiden Varietäten verschiedene vertikale Verbreitung zu haben: die beiden *falcata*-Exemplare sind in 400 und 700 m Höhe gesammelt worden, das typische in der niedrigeren Lage. Die beiden als var. *eucapitellata* bestimmten Stücke stammen aus 700 und 1,066 m Seehöhe. Die beiden Varietäten scheinen demnach

einnander in etwa 700 m. Höhe abzulosen; auch das macht das Vorkommen von Bastardexemplaren aus dieser Lage wahrscheinlich.

**LEUCOSYKE CAPITELLATA (Poir.) Wedd. var. VILLOSA, (BI.) Wedd.***

MINDORO, Malayas, Naujan, in secondary forest, sea level. Height of plant, 2 m; diameter, 4 cm. ♀, flower green. *Philip. Nat. Herb, 1958 M. Celestino* and *A. Castro,* September 17, 1947. Die zottig behaarten *capitellata*-Exemplare von den Philippinen sind hier, anders als in meiner Monographie, zu var. *villosa* gerechnet. Mit dieser Bestimmung will ich indessen noch nicht sagen, dass ich die var. *villosa,* wie sie sich nunmehr praesentiert, als eine monophyletische Einheit ansehe. Ich halte für möglich, dass die zottig behaarten Exemplare verschiedener geographischer Herkunft unäbhangig voneinander entstandene lokale Varietäten sein können. Zu dieser Auffsung führt mich die Beobachtung, dass die auf den Philippinen gesammelten zotting behaarten Exemplare selbst in ihrer Behaanicht vollkommen übereinstimmen: Die in Mindoro gesammelten Pflanzen (davon besonders die vorstehende, *Philip. Nat. Herb. 1958,* die folgende, *Philip. Nat. Herb. 3314,* ist anscheineod schon stark verkahlt) sind am Stämmchen abstehend behaart, so dass es für das blosse Auge ohne weiteres erkennbar ist. Diese Behaarung scheint dem in Mindanao eingebrachten Stück (*Philip. Nat. Herb. 1303*) vollkommen zu fehlen; sie ist auch an den Stellen nicht zu finden, die vor dem Verkahlen durch Reibung im Herbar geschützt sind. Merkwürdigerweise ist aber das Exemplar von Mindanao auf der Nervatur der Blattunterseite stärker behaart als die Mindoro-Stücke, obwohl im allgemeinen die Behaarung der Blattunterseite der des Stamchens und der Blattstiele entspricht. Die Blätter des Mindanao-Stückes haben auch eine andere Spreitenform (vgl. die Notiz zu diesem Exemplar). Diese ziemlich gedrungene Form der Spreite mit dem breiten Grunde ist ähnlich auch bei einer Mindoro-*capitellata* ausgeprägt (*Philip. Nat. Herb. 3232*), die aber nicht zottig, sondern nur ganz kurz, wenn auch leicht abstehend behaart ist. Mt. Halcon, Catuiran River, along ridge in forest, alt. 833 m. Tree, 5 m high; diameter, 7 cm. ♀, fruit green. *Philip. Nat. Herb. 3314 G. E. Edaño,* February 23, 1948.

Das Stück ist teilweise schon stark verkahlt. Die weiblichen Köpfchen sind kurz gestielt.

MINDANAO, Davao Province, Madaum, on secondary forest, alt. 8 m. Height of plant, 4 m; diameter, 15 cm. ♀, fruit green. *Philip. Nat. Herb. 1303 G. E. Edaño,* October 11, 1946. Vgl. zu diesem Exemplar auch die Notis zu den *villosa*-Stücken von Mindoro.

Das Stück fällt durch die gedrungene Form seiner Blätter auf, die am Grunde sehr breit sind und, besonders die älteren, eine sehr schiefe Blattbasis haben. Der Spreitenrand nähert sich auf der einen Blattseite dem Grundnerven allmählich und erreicht ihn etwa dort, wo der Grundnerv sich von der Mittelrippe trennt. Auf der anderen Siete ist der Spreitenrand plötzlicher eingezogen und erreicht den Grundnerven schon eher, ehe dieser die Mittelrippe berührt. So bildet, besonders von der Blattunterseite her gesehen, der Grundnerv von seiner Trennung von der Mittelrippe ab ein Stück weit die äussere Begrenzung der Blattspreite. Diese Verhältnisse deuten sich übrigens bei einem in Mindoro gesammelten *capitellata*-Stück eben an; gerade dieses Stück entbehrt aber der zottigen Behaarung, so dass es hier zu var. *eucapitellata* gerechnet worden ist.

**LEUCOSYKE SAMARENSIS M. Unruh, sp. nov.**

Ramuli teretiusculi brunneo-subtomentosi dense adpresse albido-pilosuli et remotiuscule villosi demum glabrescentes. Stipulæ deciduæ maiusculæ brunneo-tomentosæ adpresse albido-pilosulæ in costis villosæ usque ad totam fere longitudinem connatæ. Folia mediocria vel et maiuscula breviuscule isopetiolata. Lamina chartacea demum subcoriacea sæpe rugosa vix inæquilatera elliptica usque fere ovata acuminata basi rotundata regulariter dentata vel serrato-dentata dentibus apiculatis marginibus villosociliatis superne albido-strigillosa remotiuscule villosa subtus in nervis venisque prominentibus ut in ramulis vestita in interstitiis dense albido-tomentosa. Nervi laterales utrinque 3 vel 4 vel et (raro) 5. Venæ sæpe simplices varie arcuatæ vel subangulatæ vel una vena interna cum duabus aut tribus externis angulatim conjuncta interdum et una externa cum duabus internis conjuncta. Dioica. Inflorescentiæ masc. breviter pedunculatæ, fem. non visæ. Flores masc. 5-meri lobis dorso albidopilosuli pistilli rudimentum niveolanatum.

SAMAR, Bagacay, Concord, open place near road km 58.5 near bridge, 2nd growth forest, alt. 200 m. Tree, 5 m high; diameter, 5 cm. ♂, flower pink. *Philip. Nat. Herb. 6334 M. D. Sulit* and *E. Conese,* May 15, 1948.

Das Exemplar ist in der kräftig hervortretenden Nervatur der Blätter der in Dinagat gesammelten var. *aspera* von *L. Elmeri* M. Unruh besonders ahnlich und ist offenbar eine Verwandte dieser Art, an deren Verbreitungsgebiet sie sich im Norden anschliesst. Die Stipeln sind bis zu 36 mm lang, an ihrer Spitze etwa 2 mm frei. Der längste Blattstiel misst 14 mm.

**LEUCOSYKE WEDDELLII M. Unruh var. EU-WEDDELLII M. Unruh.**

LUZON, Zambales Province, Mt. Pinatubo-Villar, grassland, alt. 350 m. Shrub, 1 to 1.5 m high, ♀. *Philip. Nat. Herb. 4708 R. B. Fox,* June 8, 1948. Local name: *Pugo-lukós.* Dialect: Pint. shl. Die Stipeln sind höher verwachsen als in der Art-diagnose angegeben.

**LEUCOSYKE WEDDELLII M. Unruh var. ACUMINATA M. Unruh.**

PALAWAN, Mt. Purabi, shrub (soft), 3 m high, ♀, flower brownish-white. Local name: *Inrarása.* Dialect: Tagb.—*L. E. Ebalo* and *H. C. Conklin 1276,* August 5, 1947; Babuyan, Puerto Princesa, along streams in forest, low alt. Small tree, 2.5 m high; diameter, 8 cm. ♂, flower white. *Philip. Nat. Herb. 77 G. E. Edaño,* March 20, 1947; Babuyan, Puerto Princesa, secondary forest. Height of plant, 1 m; diameter, 4 cm. ♂, flower white, fruit green (die gesammelten Zweige haben junge mannliche Köpfchen). *Philip. Nat. Herb. 62 G. E. Edaño,* March 15, 1947; Bacuñgan, Puerto Princesa, on slopes in forest, low alt. Height of plant, 1 m; diameter, 4 cm. ♂, flower white. *Philip. Nat. Herb. 191 G. E. Edaño,* March 28, 1947; Secondary forest near Kaingin, low alt. Height of plant 2 m, diameter, 10 cm. ♂, flower white, fruit green (die gesammelten Zweige sind mannlich). *Philip. Nat. Herb. 133 G. E. Edaño,* March 16, 1947; Brooke's Point, secondary forest along river, low alt. Tree, ♂, fruit green (die gesammelten Zweige sind mannlich). *Philip. Nat. Herb. 235 G. E. Edaño,* April 26, 1947.

Die sechs in Palawan gesammelten Pflanzen seigen die wenig verwachsenen, lang pfriemlich geschwänzten Stipeln der *ovalifolia*-Gruppe. Einige von ihnen haben Blätter mit schmalem bis spitzem Grunde. Die breiteste Stelle der Spreite liegt dann hoch, vom Grunde weiter entfernt. Das ist besonders bei *Philip. Nat. Herb. 77* und bei dem von Ebalo und Conklin gesammelten Stück *Philip. Nat. Herb. 1276* der Fall. Bei *Philip. Nat. Herb. 62* sind die Blätter länger und allmahlicher zugespitzt und im ganzen gestreckter, doch liegt die breiteste Stelle noch immer

ziemlich hoch. Aehnlich, doch kleiner und (soweit bei den Beschädigungen noch erkennbar) kürzer sugespitzt sind die Blätter bei *Philip. Nat. Herb. 191.* Diese vier Exemplare sind sicher nicht *Leucosyke ovalifolia* im Sinne C. B. Robinson's der diese Art beschrieben hat.

Es liegen aber ausserdem zwei Stücke vor (*Philip. Nat. Herb. 133* und *235*), deren Blätter am Grunde breiter sind. Bei No. 133 erreichen manche Blätter sogar die Eiform, während andere noch elliptisch sind. Mit diesen Exemplaren scheint sich die Grenze zwischen Robinson's *L. ovalifolia* und der von mir beschriebenen *L. Weddellii* var. *acuminata* zu verwischen. Die var. *acuminata* der *L. Weddellii* müsste dann aufgehoben und mit *L. ovalifolia* vereinigt werden. Die andere Varietät, var. *eu-Weddellii,* die in Luzon vorkommt und sich durch besondere Rauhigkeit der Blätter auszeichnet, durfte nach den bisherigen Befunden ihre selbstandige Stellung beibehalten.

Wenn man die eine Varietät der *L. Weddellii* mit *L. ovalifolia* zu einer Art vereinigen will, dann wird es sich aber empfehlen, die extremen Formen auch weiterhin, etwa als Varietäten, auseinanderzuhalten. *L. ovalifolia* ist überdies von Palawan noch nicht bekannt; das Typusexemplar Robinson's ist in Culion gesammelt.

Das eine der beiden abweichenden Stücke zeight noch eine Besonderheit: an ihm ist die sonst zu beobachtende Anisophyllie, die sich besonders in der Länge der Blattstiele aüspragt, nicht zu erkennen; der langste Blattstiel misst etwa 12 mm. Mit der Verlangerung der Blattstiele ist aber, wie ich schon an anderer Stelle mitgeteilt habe, oft die Verschmalerung des Blattgrundes verbunden. In der hier vorliegenden Sammlung kann man des an einem der *Maoutia*-Exemplare beobachten (*Philip. Nat. Herb. 7387*). Damit ware die abweichende Blattform zumindest des einen der fraglichen Stücke möglicherweise zu erklären.

Ich konnte über diese Erscheinung am Herbarmaterial bisher nur spärliche Beobachtungen sammeln. Man findet gelegentlich an Zweigen mit teilweise lang gestielten Blättern und ausgepragter Anisophyllie Seitenzweige mit kleineren und durchwegs kurz gestielten Blättern, auch wenn diese Zweige schon ziemlich herangewachsen sind und schon eine Anzahl von entfalteten Blättern entwickelt haben. Auch hierfür findet sich unter den *Maoutia*-Exemplaren der vorliegenden Sammlung ein Beispial ein Blatt am Seitenspross ist etwas lauger (21 mm) gostielt. (*Philip. Nat. Herb. 4758*). Man kann, wenn man von einer

Pflanze einen deutlich anisophyllen Spross und von einer anderen einen solchen ohne diese Erscheinung hat, diese Zweige offenbar nicht ohne weiteres vergleichen, wenn man bedenkt, dess Blattstiel-Länge und Spreitenform gemeinsam abändern. Um einen Spross ohne ausgebildete Anisophyllie könnte es sich aber bei dem *Leucosyke*-Exemplar *Philip. Nat. Herb. 133* handeln.

Durch diese Ueberlegungen sind indessen mehr systematische Fragen gestellt als beantwortet. Eine sichere Antwort wird man erst geben können, wenn die Blattstellungs– und Anisophyllie-verhaltnisse durch Untersuchungen an der lebenden Pflanze zu ubersehen sind.

Floristisch ist in jedam Fall von Bedeutung, dass mindestens ein Teil der in Palawan gessamelten Pflanzen von dem in Culion eingebrachten Typusexemplar der *L. ovalifolia* abweicht. Fasst man alle diese Stücke als eine Art auf, dann ist ihr systematischer Zusammenhang dadurch gegeben, fasst man sie, wie ich es bisher getan habe, als zwei verschiedene Arten auf, dann ist der Zusemmenhang in der Zugehörigkeit zu der *ovalifolia*-Gruppe ausgedrückt. Offen bleibt die Frage, ob, falls man bei der Trennung bleibt neben *L. Weddellii* var. *acuminata* in Palawan auch *L. ovalifolia* workommt oder,—falls man die Arten vereinigt—ob in Palawan neben der Varietät einer erweiteren *ovalifolia* (mit schmalem Blattgrunde) noch die andere Varietät (mit eiformigen Blättern) verbreitet ist, wie sie in Culion als Typusexemplar der Robinsonschen *L. ovalifolia* gesammelt worden ist. Ich habe mich dafür entschieden, die Trennung der Arten noch beizubehalten. Die Restfrage, wie ich sie worstehend formuliert habe will ich offen lassen. Die beiden fraglichen Exemplare sind auf den Herbarzetteln als *L. Weddillii* var. *acuminata* bezeichnet. Durch den Zusatz "non typica" und den Hinweis auf dieses Manuskript, in dem die Schwierigkeiten naher auseinandergesetzt sind, ist aber, so hoffe ich, künftiger Klärung der Weg bereitet. Ich wunschte sehr, dass insbesonders solche Forscher, die Gelegenheit haben, die Blattstellungs– und Anisophyllieverhältnisse an den verschiedenen Sprossen kebebder Pflanzen zu studieren, an dieser Klärung sich beteiligen möchten. Solche Untersuchungen würden die Herbararbeit ausserordentlich fördern. Es ist überdies zu erwarten, dass die dabei an *Leucosyke* gewonnensen Ergebnisse auch für *Maoutia* und vielleicht noch andere Urticaceengruppen zutreffen.

*Philip. Nat. Herb. 77* hat grössers Blätter, als sie sonst in der *ovalifolia*-Gruppe erreicht werden, sie gleicht sich in diesem Merkmal *L. hispidissima* (Wedd.) Miq. an, die ich als eine der

*ovalifolia*-Gruppe benachbarte Art aufgefasst habe. Zwischen No. 77 und den anderen vermittelt hinsichtlich der Blattgrösse *Philip. Nat. Herb. 62.*

Das von Ebalo und Conklin gesammelte Exemplare hat länger gestielte weibliche Köpfchen als bisher in der *ovalifolia*-Gruppe beobachtet wurden. Die (kleineren) Blätter ähneln sehr denan von No. 77, sie sind leider samtlich abgefallen. Die Stipeln zeigen die typische Ausbildung der *ovalifolia*-Gruppe, soweit ihre Spitza nicht ebenfalls beschädigt sind.

# THE MAKING OF SOLAR INDUSTRIAL SALT IN THE PHILIPPINES

By M. I. Felizardo

*Chief Engineer, Superior Gas and Equipment Company and Member Advisory Board, Institute of Science and Technology*

Industrial salt suitable for chemical and other industrial purposes with 92 to 95 per cent sodium chloride content is a standard product in most countries. In the Philippines, however, common salt contains only from 75 to 85 per cent sodium chloride, 15 per cent or more moisture, and a considerable amount of such undesirable chemical impurities as magnesium chloride, calcium sulphate, and others. As produced today, it is very hygroscopic; that is, it absorbs moisture from the air. Unlike industrial salt, it continuously drips and loses weight in storage.

Good industrial solar salt can also be made in the Philippines using existing local salt beds and evaporation ponds, by improving present methods of handling the sea water and of crystallizing and harvesting the salt. This can be attained by effecting two important changes in these methods:

(1) The concentrated brine should be allowed to enter the crystalization ponds at not lower than 25° Baume, instead of at 14° to 17° Baume, as local salt makers do.

(2) The mother liquor should be drained off and thrown away as soon as it indicates a concentration of 29.5° to 30° Baume, and as salt crystals have been deposited. Most local salt makers let this mother liquor dry up together with the salt.

The reason for (*1*) is that calcium sulphate, one of the worst impurities in common salt, precipitates only after the brine concentration has exceeded 13.85° Baume, continuing so until just before the concentration reaches 25° Baume. To precipitate the undesirable calcium sulphate and free the brine from this impurity, the brine should be concentrated in the evaporation ponds beyond 14° Baume and up to 25° Baume.

The reason for (*2*) is that the valuable sodium chloride crystals start to precipitate in large quantities at 25° Baume and continue doing so up to about 30° Baume, while the undesirable magnesium chlorides do not start to precipitate until 30° Baume concentration is exceeded. This selective precipitation should be availed of to obtain industrial salt of high sodium chloride content and very low magnesium chloride impurities.

How can the sea water be evaporated by solar heat to attain a concentration of 25° Baume? This can be done by evaporating the brine, after having been concentrated to 14° Baume, for several days more with solar heat until it reaches the 25° Baume concentration.

To concentrate their brine to 25° Baume, Philippine salt makers do not need additional ponds area but need only a rearrangement of their existing farms. Today, the area distribution of most Philippine salt farms, as to their various evaporation ponds, does not enable them to utilize the heat of the sun in the most efficient manner. Thus, it takes salt makers more days or weeks than necessary to concentrate the brine, leaving fewer days for actual crystallization of the salt.

The following shows the area percentages of the ponds in a typical salt farm in Parañaque, Rizal, compared with the corresponding percentages in a typical salt farm in Southern Italy.

| Pond | Parañaque salt farm *Per cent* | Italian salt farm *Per cent* |
|---|---|---|
| 1 | 27.9 | 45.5 |
| 2 | 19.9 | 18.7 |
| 3 | 13.9 | 9.2 |
| 4 | 13.2 | 8.0 |
| 5 | 19.1 | 5.8 |
| Crystallization beds | 6.05 | 12.8 |

The above data show that most Philippine salt farms have their first ponds too small and their last ponds too large. Thus, there is plenty of pond area for the final concentration stages but insufficient area for the first concentration stages. It should also be remembered that, with the area percentages of Philippine salt farms, the brine is concentrated to only 14° to 17° Baume, while area percentages in the Italian salt farm quoted above are for 25° Baume brine.

A recent calculation of the pond area percentages suitable for Philippine salt farms, considered with the prevailing average rates of evaporation obtainable from solar heat during the months of December to May, and the fact that the sea water available near the salt farms might be slightly diluted due to proximity to the mouth of a river, gives the following values:

| Pond | Degrees Baume | Per cent |
|---|---|---|
| 1 | 3.4–6.8 | 53.5 |
| 2 | 6–8–11 | 15.4 |
| 3 | 11–15 | 10.5 |
| 4 | 15–20 | 7.2 |
| 5 | 20–15 | 3.9 |
| Crystallization beds | | 9.5 |

To render existing Philippine salt farms suitable for making industrial salt, the evaporation ponds should be rearranged to conform more or less with the above percentages. This involves the relocation of some dikes and dike openings. For most efficient utilization of the solar heat under different operating conditions existing in a specific salt farm, a recalculation is needed, although this ordinarily can be dispensed with for practical purposes.

A practice in salt making operation apparently not well understood in the Philippines concerns the adjustment of the level or height of the sea water in the various ponds to hasten or retard the attainment of a desired concentration. This is most important in the early stages of the salt making season when the salt maker desires to concentrate the sea water to the highest possible value so that he could start his salt making sooner. In many Philippine salt farms, the start of the crystallization operations is often delayed until late February or the middle of March merely because the sea water had not been concentrated sufficiently before these months. Even if strong rains occur during December and January, it is quite possible to reduce the delay in the start of the crystallization operations by proper adjustments in the sea water level inside of the various ponds.

A low sea water level inside of any pond will bring about a more rapid rate of concentration than a high sea water level. When one pond is found to be concentrating the brine at an undesirably slower rate than other ponds preceding or succeeding it, the rate of concentration can be accelerated by admitting less brine from the preceding pond or sending back some of the brine to any of the other ponds, thus making the brine level lower in that pond.

If a pond with an area of 1,000 square meters is filled with sea water on December 1st to a height of 50 centimeters, the pond will attain a concentration of about 15° Baume in late February, and a concentration of 25° Baume about 8 days later. But if the same pond is filled to a height of only 30 centimeters, the 15° Baume concentration would be reached by the end of January and the 25° Baume concentration about 5 days later.

This does not mean that the amount of concentrated brine which could be obtained one month earlier would be the same, because the total amount of water evaporated from the surface of any pond during any given number of days is beyond the control of anyone. But it does mean that the salt crystalliza-

tion production can be started sooner and the available solar heat can be utilized in the crystallization ponds that much earlier too.

The brine of specific concentration obtainable after a given number of days of evaporation is of lesser quantity with the starting sea water level of 30 centimeters than that obtainable with the starting sea water level of 50 centimeters, but in the latter case, crystallization work cannot be started until after about a month's delay during which the sun's heat is wasted on the empty crystallization beds.

However, this lowering of the brine level to hasten the concentration of the brine has its limit. The salt maker needs a sufficient quantity of concentrated brine for use during the entire salt-making season; otherwise his crystallization operations will end in May while the solar heat is still strong. For maximum utilization of available solar heat, he should have the data for the proper brine levels and pond areas for every specific salt farm, by taking evaporation records of each salt farm every day for many years, so that the evaporation rates to be expected during each day of a new salt-making season could be forecast and the proper brine levels determined from these evaporation rates. This is to enable one to adjust the brine levels in the ponds so as to obtain a 25° Baume concentration of the brine for the crystallization ponds at the time when that concentrated brine is needed, and for the longest possible salt-making period.

The next important question involves the removal of the mother liquor at 30° Baume after most of the salt crystals had been formed and deposited on the salt beds.

The mother liquor at 30° Baume may be removed from the salt beds easily, by not allowing the liquor to become too concentrated, as above 30° Baume, it will not flow off readily. In Italy, salt makers drain off the liquor when it reaches 29.2° Baume, in which case it is slightly more fluid, but the salt is more pure and the harvest slightly less.

To do this all salt beds should be sloped slightly towards a drain hole leading to a small drain canal. The drain should be plugged during crystallization time, and opened just before the mother liquor exceeds the 30° Baume concentration. The drain canal must lead towards the sea in a direction farthest away from the sea water inlet to the first evaporation pond in order not to contaminate the incoming sea water. Some salt makers

abroad lead all the mother liquor to an empty pond and hold it there until the end of the salt-making season, when its disposal will present no problem.

The following table gives the approximate compositions of the sea water from which salt is made, the concentrated brines just before being admitted into the cystalization beds, the mother liquor removed in the case of industrial salt, the dripping losses during making and storage in the case of Philippine common salt, and the salt obtained directly from salt beds. These are presented in order to show what is lost and what is gained when the mother liquor is separated and thrown away before making industrial salt, as against what is lost in making common salt.

| | Sodium chloride content *Kg* | Magnesium chloride content *Kg* | Calcium chloride content *Kg* | Insolubles and others *Kg* | Water or moisture *Kg* |
|---|---|---|---|---|---|
| Sea water | 26.4 | 3.6 | 2.8 | 1.3 | 989.9 |
| Brine concentrated to 15° Baume | 26.4 | 3.6 | 2.0 | 0.8 | 211.2 |
| Brine concentrated to 25° Baume | 26.4 | 3.6 | 0.8 | 0.6 | 100.6 |
| Common salt obtained from the salt beds | 25.0 | 1.8 | 1.0 | 0.3 | 4.9 |
| Industrial salt obtained from salt beds | 24.4 | 0.15 | 0.18 | 0.13 | 1.1 |
| Mother liquor dripping from common salt after harvesting | 1.4 | 1.8 | 1.0 | 0.5 | 2.0 |
| Mother liquor dripping from common salt during storage | 2.4 | 1.02 | 0.43 | 0.03 | 2.0 |
| Mother liquor purposely removed from the salt beds | 2.0 | 3.45 | 0.62 | 0.47 | 4.0 |
| Common salts after long storage | 22.6 | 0.78 | 0.57 | 0.27 | 2.9 |

Philippine makers of common salt harvest approximately 33 kg of moist salt from each cubic meter of sea water. This salt is very impure and drips continuously during storage until its weight drops to about 27 kg. Industrial salt obtained right after harvesting weights 26 kg for every cubic meter of sea water, but has a much higher sodium chloride content and a very little moisture and low impurities content. Philippine salt makers, therefore, hardly gain any advantage in the overall results in letting the mother liquor remain and dry up with the crystallized salt.

To admit more 25° Baume concentrated brine into the salt bed even after the salt crystals have already fully formed from the previous amount of concentrated brine is considered a good practice. This should be done everyday so as to build up a thick layer of salt in the same bed.

In the large salt farms of California, the salt is allowed to reach a thickness of six inches or more before harvesting; but in Italy and Spain, also reportedly in Formosa, most small salt makers keep the thickness of salt deposit down to only one inch or less. The reason is that in large salt farms, it is economical to employ machinery to harvest the thick mass of hardened salt from the beds; while in small salt farms, a salt deposit that is too thick becomes too difficult to break up and harvest even with picks and shovels. In the Philippines, a salt deposit of about one or two centimeters might be the most economical thickness, but that must be found by tests, computations and actual operations.

For a salt bed having an area of 35 square meters a net amount of 270 to 300 kilos of industrial salt could be obtained from 1,400 liters of concentrated brine at 25° Baume after five days. This amount of brine, if put at one time into that salt bed, would be about four centimeters high, requiring the borders of the salt beds to be raised to five centimeters or more. This can be done economically by joining several salt beds of the same elevation and raising the borders of the group together.

Most salt beds in the Philippines are so made that only ½ centimeter of brine could be put in at one time, allowing only half a sack of salt to be obtained therefrom daily. This is because Philippine salt makers believe that it is best to harvest some salt from each salt bed each day. However, salt makers abroad, including those in small salt farms in Asiatic countries, have found from hundreds of years of experience that more salt can be harvested from a given area during a given period of time if the salt is allowed to deposit continuously for several days (in California it is several months) than if it is harvested everyday.

The total time consumed in harvesting salt from a salt bed daily for five days is always much longer than the time needed to harvest the salt from the same salt bed only once every five days. In other words, if the time lost per day at sundown for havesting everyday is ½ hour, the time that would be lost

once in five days is not going to be five times or 2½ hours for harvesting five times the amount of salt, but much less. It should be recognized that evaporation continues to take place even after sundown because of the heat accumulated in the brine and in the salt which assists in continuing evaporation even after sunset. In harvesting a salt bed everyday the heat accumulated by the salt is not only wasted, but its evaporative effect is not utilized. Multiplying the number of salt beds by the number of days of salt-making, one can see the amount of solar heat wasted, which, if utilized, could mean several thousand kilos of additional salt in one season.

Harvesting once every five days, however, does not mean that no harvesting should be done during the other four days. It simply means that only 40 salt beds should be harvested each day instead of 200 everyday, if there are 200 beds in all in the farm. This gives another advantage. The harvested salt will be handled and transported only from one small area each day instead of from all over five times that area. And if the beds are grouped together with one common border for each group, the working area is more convenient for handling the salt.

Philippine salt makers believe that if the salt is left in the beds and not harvested everyday, the salt may be lost in case a rain occurs. This is true if the borders of the beds are low and would allow overflowing. It is for this reason that salt beds in other countries are built with much higher borders than salt beds in the Philippines.

Salt crystals dissolved by the rain is not lost, provided the brine is not allowed to overflow the salt borders. The dissolved salt or brine should be returned to one of the 25° Baume evaporation ponds where the dilution effect will hardly be noticeable. In this case, no more brine from the preceding evaporation pond should be added to it until after subsequent solar evaporation when the concentration of the pond again attains a value of 25° Baume.

It should not be difficult for salt makers to realize the overall advantages of discarding their old methods of making salt and adopting the methods used in salt farms abroad that have approximately the same climatic and sea water conditions as those found in this country. These methods may be new and strange for Philippine salt makers but they are ordinary and taken for granted by salt makers abroad. The danger would be

if we try to adopt foreign saltmaking methods for large scale production requiring much machinery, power and fuels, when our salt farms are of very small scale. But there are hundreds of thousands of small scale salt farms abroad whose methods are suitable for Philippine conditions.

It is hoped that the foregoing remarks will be of interest and usefulness to our Philipine salt makers. It is also hoped that they will soon realize that, if Chinese in Formosa and Hindus in India know how to make good salt by solar heat, there is no reason why Filipinos cannot do that too.

In this connection, attention is invited to the following technical data which is intended to enable technical men engaged in salt-making to make similar computations on specific salt farms.

## TECHNICAL SALT-MAKING DATA

(1) *Basic fresh water net evaporation October 16 to January 5 inclusive* = 82 days = 42 mm October + 87 mm November + 92 mm December + (3.8 × 5 = 16 January) = 237 mm (If November 1 to January 5 = 195 mm only)

(2) *Average evaporation January 6 to May 10 = 125 days:*

Total = (130 January 6 to 31) + (188 February) + (247 March) + (249 April) + $\left(10 \times \frac{6.8 + 4.2}{2}\right)$ = 55 May = 869 mm

Average = $\frac{869}{125}$ = 6.95 mm/day

Minimum = 4.0 mm January 6 = 67.5 per cent of average value
Maximum = 8.7 mm April 20 = 125 per cent of average value

(3) *Brine volumes and volume reductions:*

| | Brine density | Brine volume | Volume reduction between ponds | Total volume reduction |
|---|---|---|---|---|
| Sea water ..... | 2.5° Be | 1130 $M^3$ | | |
| (Sea water ..... | 3.5° Be | 1000 $M^3$ | 130 $M^3$) | |
| 1st Pond (from 2.5°) ..... | 7° Be | 626 $M^3$ | (from 2.5°) 504 $M^3$ | |
| 2nd Pond (from 2.5°) ..... | 11° Be | 345 $M^3$ | 281 $M^3$ | 785 $M^3$ |
| 3rd Pond (from 2.5°) ..... | 15° Be | 222 $M^3$ | 123 $M^3$ | 908 $M^3$ |

| | | | | |
|---|---|---|---|---|
| 4th Pond (from 2.5°) ..... | 20° Be | 148 M³ | 74 M³ | 982 M³ |
| 5th Pond (from 2.5°) ..... | 25° Be | 112 M³ | 36 M³ | 1018 M³ |

(4) *Evaporation correction factors from net evaporation for fresh water:*

For 2.5° to 7° Be = 0.88
For 7° to 11° Be = 0.88
For 11° to 15° Be = 0.84
For 15° to 20° Be = 0.76
For 20° to 25° Be = 0.70

For 2.5° to 11° Be = 0.88
For 2.5° to 15° Be = 0.86
For 2.5° to 20° Be = 0.82
For 2.5° to 25° Be = 0.79

(5) *Pond areas:*

1st Pond (2.5 to 7°) $= \frac{504\ M^3}{6.95\ mm \times 0.88} = 82{,}400\ M^2 = 47.6\%$

2nd Pond (7 to 11°) $= \frac{281\ M^3}{6.95\ mm \times 0.88} = 46{,}000\ M^2 = 26.6\%$

3rd Pond (11 to 15°) $= \frac{123\ M^3}{6.95\ mm \times 0.84} = 21{,}100\ M^2 = 12.2\%$

4th Pond (15 to 20°) $= \frac{74\ M^3}{6.95\ mm \times 0.76} = 14{,}200\ M^2 = 8.2\%$

5th Pond (20 to 25°) $= \frac{36\ M^3}{6.95\ mm \times 0.70} = 7{,}400\ M^2 + 25\% = 9{,}300 = 5.4\%$

$173{,}000\ M^2 = 17.3$ Ha. 100.0%

(Excluding crystalization beds)

(6) *Brine levels at ponds for starting-evaporation October 16 to January 5:*

1st Pond (2.5° to 7°) $= \frac{237\ mm \times 0.88 \times 1130\ M^3 \text{ at } 2.5°}{504\ M^3 \text{ at } 7°} = 468$ mm

2nd Pond (2.5° to 11°) $= \frac{237 \times 0.88 \times 1130}{785} = 300$ mm

3rd Pond (2.5° to 15°) $= \frac{237 \times 0.86 \times 1130}{908} = 254$ mm

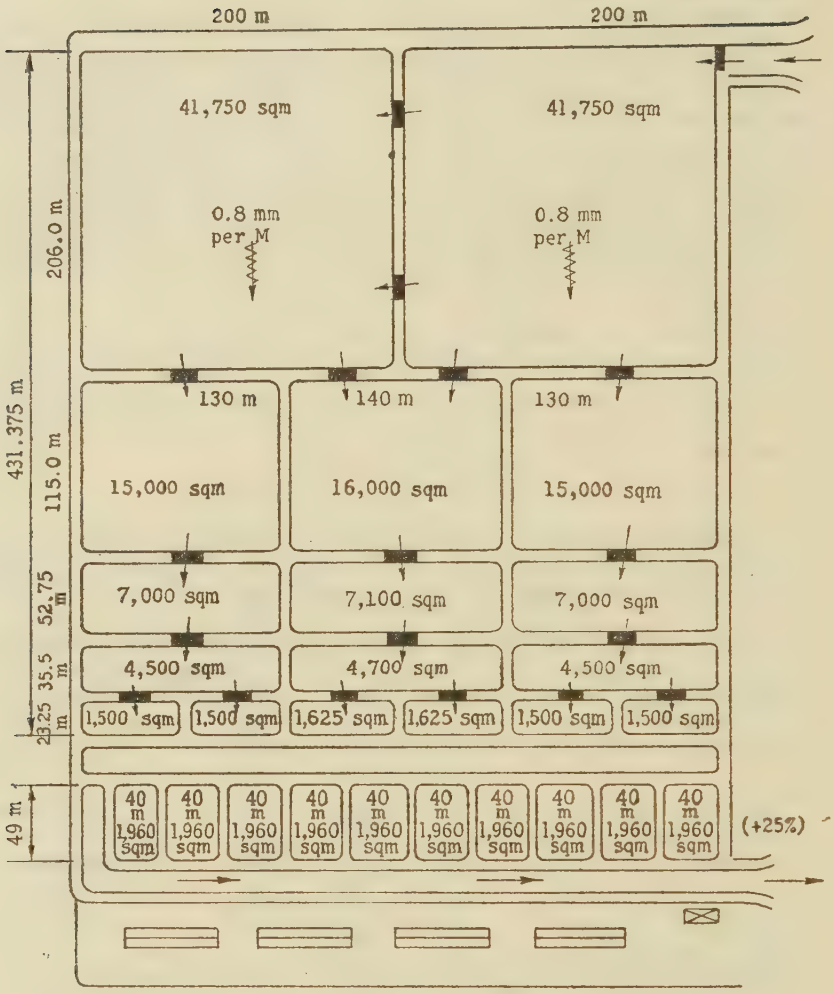
4th Pond (2.5° to 20°) $= \frac{237 \times 0.82 \times 1130}{982} = 224$ mm

5th Pond (2.5° to 25°) $= \frac{237 \times 0.79 \times 1130}{1018} = 208$ mm

(7) *Brine levels at end of starting-evaporation period January 5:*

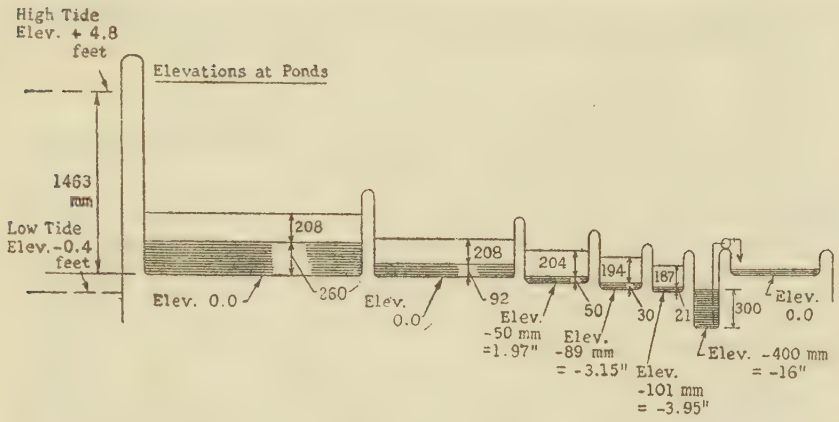
1st Pond (7° Be) = 468 mm October 16 − 237 × 0.88 total evaporation to January 5 = 468 − 208 = 260 mm

2nd Pond = 300 mm − 237 × 0.88 = 300 − 208 = 92 mm
3rd Pond = 254 − 237 × 0.86 = 254 − 204 = 50 mm
4th Pond = 224 − 237 × 0.82 = 224 − 194 = 30 mm
5th Pond = 208 − 237 × 0.79 = 208 − 187 = 21 mm




(8) *Brine volumes and heights of brine for each day's consumption:*

| | Entering ponds | | Leaving ponds | | Final heights (Including starting brine) |
|---|---|---|---|---|---|
| 1st Pond | $\frac{1130\ M^3}{82{,}400} = 13.7$ mm | | $\frac{626}{82{,}400} = 7.5$ mm | | 267.5 mm |
| 2nd Pond | $\frac{626}{46{,}000} = 13.6$ mm | | $\frac{345}{46{,}000} = 7.5$ mm | | 99.5 mm |
| 3rd Pond | $\frac{345}{21{,}100} = 16.4$ mm | | $\frac{222}{21{,}100} = 10.5$ mm | | 60.5 mm |
| 4th Pond | $\frac{222}{14{,}200} = 15.7$ mm | | $\frac{148}{14{,}200} = 10.4$ mm | | 40.4 mm |
| 5th Pond | $\frac{148}{9{,}300} = 16.0$ mm | | $\frac{112}{9{,}300} = 12.1$ mm | | 33.1 mm |




(9) *Salt yield:*

From January 6 to May 10, average of 112 M³/day of 25° Be brine,

to be fed to beds { Minimum 67.5 per cent of 112 = 76 M³/day
Maximum 125.0 per cent of 112 = 140 M³/day

Yield of salt from 112 M³ 25° Be brine, or from 1000 M³ of 3.5° Be sea water or from 1130 M³ 2.5° Be sea water

$$= \frac{21.4 \text{ Kg NaCl} \times 1000 \text{ M}^3}{0.93 \text{ (NaCl content of salt)}} = 23 \text{ MT salt average from beds/day}$$

or 15.6 MT minimum/day
to 28.8 MT maximum/day

Yield during the season = 125 days × 23 = 2870 MT

Less harvesting losses due to rain and other losses of time — 13 per cent = 2500 MT

(If crystallization period cannot be started January 6 but delayed say 15 days to January 21, yield = 2200 MT)

(10) *Mother liquor:*

Sp. gr. of mother liquor = 1.292 at 30° Be

30 M³ obtained from 112 M³ of 25° Be = 38.8 MT mother liquor

Original 112 M³ at 25° Be at 1.196 spgr = 134 MT

Salt yield = 23 MT

Water evaporated = 134 — (23 + 38.8) = 134 — 61.8 = 72.2 MT or M³

Volume of salt and mother liquor together = 35.4 M³ salt + (30 M³ — liquor between the salt crystals = 10.6 M³) = 54.8 M³

Total height of salt with liquor, in the beds $= \frac{54.8}{1960} = 28$ mm

or 1.1 inches = 9.9 mm of liquor over the salt

(11) *Crystallization bed area:*

112 M³ of 25° Be brine each day if admitted into a large bed of the necessary area will require evaporation of 72.2 M³ to convert the brine to salt with mother liquor at 30° Be

Evaporation rate = 6.95 mm basic × 0.53 factor of evaporation at 25° to 30° = 3.68 mm/day

$\frac{72.2}{.00368}$ = 19,600 sqm

Add 25 per cent variation in rate over the average = 4.900 sqm
Total crystalization bed area = 24,500 sqm

(12) *Total areas:*

Total pond and bed area = 173,000 + 24,500 = 19.75 hectares
Add 3.8 Ha. or 14 per cent for dikes, canals, storage, service, and wasted areas = 22.55 hectares

(13) *Crystallization operations:*

Bed area divided into 12½ sections at 1960 sqm
All the 112 $M^3$ of 25° Be brine (+ 25 per cent and 32½ per cent) admitted into each section successively each day (= 75.8 $M^3$ to 140 $M^3$)
Harvesting every 10 days from each section (2½ sections spare)

Brine height = $\frac{112\ M^3}{1960\ sqm}$ = 0.0572 m = 57.2 mm = 2¼ inches (ave.)

or $\frac{75.8}{1960}$ = 0.0386 m = 38.6 mm = 1½ inches (min.)

or $\frac{140}{1960}$ = 0.0715 m = 71.5 mm = $2\frac{13}{16}$ inches (max.)

Dykes around beds should be at least 40 mm higher than maximum = 112 mm or more.

Apparent density of salt crystals as formed and piled in the beds = 0.6 to 0.7 or average of 0.65
From 112 $M^3$ of 25° Be brine, 23 MT salt will be harvested = 35.4 $M^3$ volume (23.8 $M^3$ minimum; 44.2 $M^3$ maximum)
Space occupied by salt in 1960 sqm of bed area when ready to harvest = $\frac{35.4}{1960}$ = 0.0181 = 18.1 mm = $\frac{23}{32}$ inch thick (12.2 mm minimum; 22.6 mm maximum) for 10-day harvest.
(If 6-day harvest, divide total area into 7½ sections; if 14-day harvest, divide into 17½ sections; if 20-day harvest, divide into 25 sections)

# SNAKEBITE MORTALITY IN THE PHILIPPINES

By Arturo C. Reyes and Carl Lamanna *
*Institute of Hygiene, University of the Philippines*

In a recent report outlining the problem of snakebite mortality in different areas of the world, Swaroop and Grab [1] stated that in the Philippines "relatively few poisonous reptiles are found, and mortality from snakebite is therefore negligible." This statement does not give an accurate picture of the situation existing in the Philippines. In order to help complete this picture, itself an admirable summary of the problem, the authors present in this paper additional information they have been able to gather on snakebite mortality in the Philippines.

While many areas in the Philippines remain poorly explored by the herpetologist, it is a fact that many species of both poisonous and non-poisonous snakes have been identified. The authors have not been able to locate any comprehensive taxonomic compendium of Philippine snakes of recent origin, the most authoritative work being a thirty-three year old monograph by Taylor.[2] The following summary of the number of genera and species of poisonous snakes found in the Philippines is derived from this authority:

| Family or subfamily | Genera | Species |
|---|---|---|
| Slightly poisonous: | | |
| Boiginæ | 5 | 10 |
| Deadly poisonous: | | |
| Hydrinæ (sea snakes) | 5 | 10 |
| Crotalidæ (pit vipers) | 1 | 7 |
| Elapinæ (cobra and allies) | 3 | 7 |

The earliest account of snakebite deaths in the Philippines is an unpublished manuscript entitled "Poisonous Snakes in the Philippines," prepared by A. Catanjal for the Philippine Health Service in 1912. In this account, Catanjal reports 86 deaths, in 1909, from snakebites in 14 provinces, a rate of 3.14 deaths per 100,000 population. He was of the impression that most deaths were caused by bites of the cobra *Naja naja*. If newspaper ac-

* Visiting Professor (WHO) from the Johns Hopkins University School of Hygiene and Public Health, Baltimore, Maryland, U.S.A.

[1] Swaroop, S., and B. Grab. World Health Organization Bull. 10 (1954) 35.

[2] Taylor, E. H. The Snakes of the Philippine Islands. Bureau of Science Monograph 16 (Manila, 1922) 312 pp., *37 pls.* and *32 text figs.*

counts of snakebite deaths were taken at face value, this cobra species would seem to be today as in the past the chief offender species.

Cobra antivenin is prepared locally by the Alabang Serum and Vaccine Laboratories of the Department of Health. An effort was made to determine the extent of the snakebite problem by analyzing the volume of production and sales of this product. This proved to be unsatisfactory since the volume of production and sales was very irregular due to difficulties connected with production, distribution, and storage. Most cases of snakebite occur in rural areas where transportation facilities and medical care are inadequate. Hence most snakebite victims succumb to the attacks before medical assistance can be rendered and antivenin can be used.

The collection of vital statistics in the Philippines was markedly disrupted during World War II and to date reporting remains unsatisfactory. In official statistics deaths from snakebites are included at present under the heading "All Other Accidents," and no breakdown of the items included is possible. It has, therefore, been necessary to compile and use in this paper available pre-war data.[3, 4] Prior to 1928 snakebite deaths were included under category 165a, "Venomous Bites and Stings," and from 1928 to 1940, under category 176, "Attacks by Venomous Animals" (International List of Causes of Death, 1929 revision). The exact number of snakebite deaths could not be determined, because the deaths are not recorded according to the nature of the attacking animals. Yet it is quite probable that the overwhelming number of deaths recorded are from snakebites, since the Philippine fauna includes no poisonous lizards, and no aggressive species of invertebrates capable of inflicting usually fatal bites. Rarely anaphylactic deaths are encountered in clinical practice due to stings from bees and wasps.

*Incidence of snakebite mortality.*—Deaths due to attacks of venomous animals constitute only a small proportion (0.07 per cent) of all deaths in the Philippines. On the average, a total of 183 deaths are recorded each year of which 135 (73 per cent)

[3] Philippines. Bureau of Health. Annual Reports 1919 to 1938.

[4] Philippines. Bureau of the Census and Statistics. Yearbook of Philippine Statistics, 1940. Manila, Bur. of Print., 1941.

are among males and the rest among females. The ratio of male to female deaths is approximately 3 to 1. Because of their occupation, particularly in rural areas, males are more exposed to the risk of snakebites than females.

The average annual mortality rate caused by attacks by venomous animals is 1.26 deaths per 100,000 population. There is little annual variation in mortality rates from 1928 to 1940. The mortality rates are much lower than that given by Catanjal in 1909 (3.14 deaths per 100,000 population) probably because Catanjal's report included only 14 provinces in all of which snakebite deaths occurred. Actually there are some provinces where no deaths are reported. Furthermore Catanjal used the population data of 1903 to compute the rate for 1909 deaths.

TABLE 1.—*Deaths caused by attacks by venomous animals, crude death rates and proportionate mortality rates, Philippines, 1928 to 1940.*

| Year | Deaths due to attacks by venomous animals | | | Rate per 100,000 population | Crude death rate | Proportionate mortality |
|---|---|---|---|---|---|---|
| | Male | Female | Total | | | |
| | | | | | | *Per cent* |
| 1928 | 137 | 44 | 181 | 1.42 | 17.45 | 0.08 |
| 1930 | 139 | 52 | 191 | 1.43 | 19.32 | 0.07 |
| 1931 | 124 | 42 | 166 | 1.22 | 17.97 | 0.06 |
| 1932 | 120 | 54 | 174 | 1.25 | 15.43 | 0.08 |
| 1933 | 134 | 43 | 177 | 1.25 | 16.20 | 0.07 |
| 1934 | 132 | 49 | 181 | 1.25 | 16.66 | 0.07 |
| 1935 | 143 | 44 | 187 | 1.27 | 17.46 | 0.07 |
| 1936 | 132 | 35 | 167 | 1.11 | 15.85 | 0.06 |
| 1937 | 124 | 57 | 181 | 1.18 | 16.49 | 0.07 |
| 1938 | 143 | 48 | 191 | 1.22 | 16.56 | 0.07 |
| 1940 | 159 | 57 | 216 | 1.30 | 16.50 | 0.07 |
| Average | 135 | 48 | 183 | 1.26 | 16.89 | 0.07 |

*Age distribution of deaths.*—The percentage age distribution of deaths caused by attacks by venomous animals is greatest in the age group 5 to 14 years. The proportion then decreases as the age increases. It will be noted that in both 1931 to 1935 and 1940, more than half of the deaths occurred in the ages under 25 years. Yet the risk of dying from attacks by venomous animals is greatest in the age group 45 to 54 years. Higher age specific death rates are observed in the older (35 years and above) than in the younger age groups (Table 2).

TABLE 2.—*Percentage age distribution and age specific mortality rates per 100,000 population of deaths due to attacks of venomous animals, Philippines.*

| Age group | 1931–1935 | | 1940 | |
|---|---|---|---|---|
| | Percentage distribution | Mortality rate per 100,000 population | Percentage distribution | Mortality rate per 100,000 population |
| *Years* | | | | |
| 0– 4 | 3.42 | .24 | 3.7 | 0.28 |
| 5–14 | 30.45 | 1.41 | 26.85 | 1.33 |
| 15–24 | 18.52 | 1.14 | 23.58 | 1.55 |
| 25–34 | 12.16 | 1.03 | 14.81 | 1.34 |
| 35–44 | 11.58 | 1.53 | 12.49 | 1.77 |
| 45–54 | 10.77 | 2.22 | 9.71 | 2.12 |
| 55 and over | 13.08 | 1.95 | 8.79 | 1.49 |

*Deaths by season of the year.*—Table 3 shows that in the years for which data are available, more deaths occurred during the period July to January. These months include the rainy season and particularly the rice planting and harvesting seasons. Since it is not known whether rainfall has any influence on the propensity of snakes to attack humans, the greater number of deaths observed during July to January are attributed to the greater exposure of the population during the rice planting and harvesting seasons.

TABLE. 3.—*Monthly distribution of deaths caused by attacks by venomous animals, Philippines.*

| Month | 1928 | 1936 | 1937 | 1938 | 1940 | Total |
|---|---|---|---|---|---|---|
| January | 13 | 13 | 20 | 12 | 16 | 74 |
| February | 9 | 14 | 12 | 14 | 14 | 63 |
| March | 15 | 7 | 12 | 11 | 12 | 57 |
| April | 9 | 9 | 10 | 7 | 9 | 44 |
| May | 9 | 6 | 12 | 16 | 11 | 54 |
| June | 8 | 8 | 12 | 8 | 13 | 49 |
| July | 12 | 20 | 13 | 16 | 11 | 72 |
| August | 17 | 11 | 19 | 25 | 21 | 93 |
| September | 20 | 15 | 13 | 19 | 28 | 95 |
| October | 28 | 22 | 26 | 24 | 35 | 135 |
| November | 21 | 21 | 17 | 16 | 32 | 107 |
| December | 20 | 21 | 15 | 23 | 14 | 93 |

*Geographical distribution.*—The mortality rates vary from province to province and even for the same province at different years. However, the mortality rates are higher in certain provinces and negligible in others. The provinces where the mortality rates are high are given in Table 4 and prove to be mainly rice growing provinces of the most densely populated island, Luzon.

TABLE 4.—*Mortality rate per 100,000 population from bites of venomous animals per certain provinces in the Philippines.*

| Province ** | 1909 * | 1923 | 1925 | 1928 |
|---|---|---|---|---|
| Abra | | 5.0 | 4.9 | 3.6 |
| Camarines Sur | | 5.8 | 6.1 | 6.0 |
| Ilocos Norte | 10.05 | 6.9 | 8.0 | 7.0 |
| Marinduque | | 10.3 | 1.6 | 5.0 |
| Nueva Ecija | 4.47 | 6.7 | 9.0 | 8.8 |
| Nueva Vizcaya | | | 7.4 | 5.5 |
| Pangasinan | 4.02 | 2.8 | 2.9 | 4.3 |
| Tarlac | 4.44 | 9.3 | 3.7 | 6.3 |
| Zambales | | 7.9 | 7.8 | 6.6 |

* Snakebites only as reported by A. Catanjal in 1921.

** Except Marinduque all high-rate provinces are on the Island of Luzon.

## CONCLUSION

Several species of poisonous snakes are found in the Philippines. The most frequent cause of snakebite mortality is believed to be attacks by the species *Naja naja*. Snakebite mortality in the Philippines may be considered "negligible" if compared to other causes of mortality like tuberculosis, diarrhea-enteritis, etc., since it constitutes only 0.07 per cent of all deaths. However, if deaths classified under "Attacks by Venomous Animals" are assumed to be due to snakebites, the mortality rate so obtained is larger than that observed in the North American and European countries. The mortality rate (1.26 deaths per 100,000 population) is the highest observed in the countries and islands of Oceania and the Pacific. It compares favorably with the rates observed in Thailand (1.3 deaths per 100,000 population). However the mortality rate is only $\frac{1}{12}$ of that observed in Burma (15.4 deaths per 100,000 population), $\frac{1}{4}$ of India's (5.4 deaths per 100,000 population), and $\frac{1}{3}$ of Ceylon's (4.2 deaths per 100,000 population). It can be stated therefore that compared with other countries, snakebite mortality in the Philippines is by no means "negligible."

## SUMMARY

1. There are 4 families including 14 genera and 34 species of slightly poisonous and deadly poisonous snakes in the Philippines.

2. Most of the deaths classified under attacks by venomous animals are believed to be due to snakebites.

3. The average mortality from attacks by venomous animals is 1.26 deaths per 100,000 population.

4. The mortality rate from attacks by venomous animals is higher among males than females.

5. While a larger proportion of deaths occur in the younger ages, the age specific mortality rates are higher in the older age groups.

6. Deaths caused by venomous animals are more frequent during the rice planting and harvesting seasons.

7. Mortality rates are highest in rice producing provinces.

8. Snakebite mortality in the Philippines is by no means negligible if compared with that of other countries.

# SYSTEMATIC NOTES ON THE ASIAN SNAKE LYCODON SUBCINCTUS

By Alan E. Leviton
*Natural History Museum, Stanford University, California*

In examining specimens of *Lycodon subcinctus* from Indonesia and the Philippines, it was surprising to find a specimen referrable to this species bearing the locality of Bundu Tuban, Mt. Kinabalu, Borneo. In an attempt to determine, for zoogeographic purposes, whether this specimen was more similar to those known from Palawan, Philippines, or from Sumatra and Java, it was necessary to re-study the species with particular emphasis to the possibility of subspecific differentiation.

Unfortunately, *Lycodon subcinctus* does not seem to be overly abundant in any part of its range, at least judging from the numbers of specimens present in available collections. There are probably not more than thirty or so examples in American collections. It has been possible, however, on the basis of twenty-one specimens available to the writer and literature reports on an additional eighteen individuals, to distinguish three sub-specific populations, one of which it is necessary to describe as new. These three groups, to be discussed later, are: (1) *Lycodon subcinctus subcinctus* Boie, from Indonesia, Malaya, Indo-china, and Siam, (2) *Lycodon subcinctus maculatus* (Cope) from China, and (3) a form from the Philippines and Borneo.

**LYCODON SUBCINCTUS SEALEI subsp. nov.**

*Holotype.—California Academy of Sciences 15819 Alvin Seale,* May 20, 1908; adult male; Puerto Princesa, Palawan Island, Philippines.

*Paratypes.*—(5 specimens). *California Academy of Sciences 15817 Alvin Seale,* February 20, 1908; Puerto Princesa, Palawan Island. *California Academy of Sciences 62172 E. H. Taylor,* January 8, 1909; Iwahig, Palawan Island. *California Academy of Sciences 15259 J. C. Thompson;* "Philippine Islands." *Stanford University 17717 Alvin Seale,* February 20, 1908; Puerto Princesa, Palawan Island. *United States National Museum 51636 H. C. Raven;* Sungai, Borneo. *United States National Museum 130246 D. H. Johnson;* Bundu Tuban, Mt. Kinabalu, Borneo.

*Diagnosis.*—This subspecies may be distinguished from both *maculatus* and *subcinctus* on the basis of the lower subcaudal counts (apparently not exceeding 68 in any of the specimens examined, or those whose counts are mentioned in the literature.

*Description of squamation of type.*—Snout projecting well beyond the lower jaw; rostral much broader than deep, scarcely visible from above; internasals moderate, about as broad as long, sutures bordering nasal and prefrontal shields subequal, considerably longer than their mutual suture; prefrontals square, large, entering the upper corner of the eye, their mutual suture the longest; frontal moderate, very slightly longer than the prefrontal, as broad as long, triangular in shape; supraoculars longer than broad, very slightly less than ½ as broad as frontal; parietals large, 1½ times longer than frontal; nasal large, completely divided by the centrally placed large nostril, the anterior and posterior portions of the shield subequal; loreal longer than broad, entering the eye, in contact with the prefrontal, nasal, second and third upper labials; preoculars absent; postoculars 2, the upper shield slightly larger than the lower; temporals ½ + 2; upper labials 8, the third, fourth and fifth entering the eye, the third partially superimposed over the fourth in reaching the orbit of the eye, the seventh the largest; mental small, broader than long, triangular, separated from the genials by the first pair of infralabials; 8 infralabials, the fifth the largest, the first 4 in contact with the anterior genials which itself is about 1⅓ times longer than the posterior pair.

Ventrals 202; subcaudals 68; anal shield divided; scales in 17-17-15 rows, the six or seven dorsal rows faintly, but distinguishably keeled; anal divided.

*Hemipenis of type.*—Organ extends to the end of the 13th subcaudal plate; forked at extreme tip; sulcus canal unforked; walls moderately thick, not membranous; distal ⅓ calyculate, the edges of the calyces bearing numerous fleshy spines; proximal ⅔ of organ with well-developed, smooth longitudinal ridges; at distal end, and extending anteriorly for about ¼ of the organ's length is a well-developed conical-shaped ridge covered by calyces beset with spines. (This ridge, which has been found in the hemipenis of all specimens of *subcinctus*

examined, was not mentioned by Smith [(1943) 258] although most certainly it must have been present in his specimens. The ridge appears to represent an extension of the retractor muscle so that the organ is attached to the muscle for about ¼ of its total length and not merely at the distal tip. The three subspecies of *subcinctus* display a very close similarity in the structure of this organ).

*Dentition of type.*—As defined for the genus; maxillary teeth 3–3–7 (total 13); mandibular teeth 3–2–11 (total 16); pterygoid and palatine teeth 39.

*Coloration of type.*—Purplish-black above with first three body bands scarcely visible (nuchal band not apparent at all); the bands (whitish) are 6 scale rows wide and apparently separated by bandless (dark) areas of about 21 scale rows in width; dorsal color ends at edges of ventrals, or transgresses on them only slightly; ventrals dirty yellowish tending to become darker posteriorly; lower most edge of upper labials yellowish; first four and last two lower labials and mental mixture of purplish-black and yellow; remainder of infralabials, throat, and anterior ventrals uniform yellow without markings.

*Measurements of type.*—Standard length (snout to vent), 644 mm; tail length, 145 mm; head width, 12 mm; head length, 22 mm.

*Variation.*—(See Table 1). Comparison of the holotype and paratypes reveals that there is not too much variability in the scale characters. In all specimens examined the loreal always enters the eye, as does the prefrontal; there are always 8 upper labials, the third, fourth and fifth shields entering the eye (except in one case, *United States National Museum 130246*, in which the fourth and fifth shields alone border the orbit; the temporals vary between 1 + 2 and 2 + 2, with the majority of specimens having the former formula; the preocular is always absent, but the postocular can be either single or double (double in all specimens except *California Academy of Sciences 62172* and *15817*); ventrals and subcaudals show the following ranges: ventrals, males, 198 to 208, females, 204 to 211; subcaudals, males 60 to 68, females, 62 to 66; total range for ventrals plus subcaudals, 262 to 277 (including counts given in the literature, the total range is 259 to 277).

TABLE 1.—*Scale counts and measurement of specimens of Lycodon subcinctus sealei.*

| Specimen | Sex | Scale rows | Ventrals | Subcaudals | Anal plate | Labials in eye | Postoculars | Standard length | Tail length |
|---|---|---|---|---|---|---|---|---|---|
| CAS 15817 | M | 17 | 203 | 60 | 2 | 3–4–5 | 1 | 228 | 47 |
| CAS 15819 | M | 17 | 202 | 68 | 2 | 3–4–5 | 2 | 644 | 145 |
| CAS 15259 | F | 17 | 209 | 62 | 2 | 3–4–5 | 2 | 697 | 135 |
| CAS 62172 | M | 17 | 198 | 64 | 2 | 3–4–5 | 1 | 203 | 44 |
| SU 17717 | F | 17 | 211 | 66 | 2 | 3–4–5 | 2 | 262 | 53 |
| USNM 51636 | M | 17 | 210 | 63 | 2 | 3–4–5 | 2 | 317 | 62 |
| USNM 130246 | F | 17 | 204 | 64 | 2 | 4–5 | 2 | 498 | 99 |

In coloration, variation is due primarily to age; young speciments, e.g. *California Academy of Sciences 15817, 15819*; *Stanford University 17717*, etc., display typical alternation of black and white bands, the black bands on the body being almost 2½ times as broad as the white, less so on the tail. Smith [(1943) 258] pointed out that adult individuals of *subcinctus* tend to lose the bands, particularly posteriorly. It is also worthy of mention that there appears to be considerable variation in the ratio of the thickness of the black and white bands to each other in the species as a whole and it is not characteristic of any one of the subspecific populations.

Although the anal plate was double in all specimens of *sealei*, it is interesting to note that one specimen (*L. s. subcinctus*) *Museum of Comparative Zoology* (*Harvard*) *3057*, from Java, had a single plate.

This new subspecies is named for Alvin Seale, Stanford zoologist, ichthyologist, and explorer, now in his 81st year, who collected the type and several of the paratypes nearly 50 years ago.

## GENERAL REMARKS

Based on the examination of specimens of *Lycodon subcinctus* from all parts of its known range (except Indo-china), at least three subspecific populations, i.e. the Indonesian-Malayan-Siamese-Indo-Chinese group, the Chinese group, and the Philippine-Bornean group exist. They are exceedingly similar in general appearance, and in fact, the only character found to separate them is that of ventral and subcaudal counts. However, there is no extensive overlapping of these counts between the three groups. In Table 2 are given the ranges of ventral and subcaudal counts for each group.

TABLE 2.—*Ranges of ventral and subcaudal counts for each group.*

| | Indo-Malaya | China | Philippine-Bornean |
|---|---|---|---|
| Ventrals (males) | 201–220 | 190 (2) | 198–208 |
| Subcaudals (males) | 75–83 | 1 | 60–68 |
| Ventrals (females) | 213–226 | 197 | 204–211 |
| Subcaudals (females) | 71–79 | 77 | 62–66 |
| Total ventrals | 278–300 | 274 | 259–277 |
| plus subcaudals | (276–300)* | | |

* Includes the counts of *Museum of Comparative Zoology 2236*, a specimen said to have been captured at Pondicherry, India.

As can be noted in the above table, the Philippine–Bornean population can be distinguished by the lower subcaudal count, and by the lower total count of ventrals plus subcaudals; the Chinese population is distinguished from the Indochinese-Malayan-Siamese group by the lower ventral count, and from the Philippine-Bornean group by the higher subcaudal count. The following key may be used to separate the subspecies of *Lycodon subsinctus:*

1a. Total of ventrals and subcaudals below 280 (median 267.8).

2a. Ventrals below 198; subcaudals above 70; China ..... *maculatus*

2b. Ventrals above 198; subcaudals below 70; Borneo and Philippines ..... *sealei*

1b. Total of ventrals and subcaudals above 280 (median 291.2), rarely below (1 specimen from Java reported on by Schlegel [(1836) 117] had 278 v + c., and 1 specimen in the collection of the *Museum of Comparative Zoology* from "India" has only 276 v + c.); Indonesia (perhaps including southeastern Borneo), Malay Peninsula, Indo-china, and Siam ..... *subcinctus*

## NOMENCLATURAL NOTE

Shaw [(1802) 468] described the species *Coluber platurinus* based upon a specimen from an unknown locality in the collection of "Dr. Hunter's" Museum, London. The brevity of the description has led several authors to question its specific allocation ever since Duméril, Bibron and Duméril [(1854) 598] placed it as a questioned synonym of *Ophites* (=*Lycodon*) *subcinctus*. Of course this brings up the question of priority, if Shaw indeed did describe this species, for Boie's name *subcinctus* did not appear until 1827 (actually 1826 as a *nomen nudum*).

Cantor [(1847) 916] believed that Shaw's name *C. platurinus* could be applied to Boie's species, and therefore, suppressed the name *subcinctus*. As mentioned above, Duméril, Bibron and Duméril (*op. cit.*) placed Shaw's name as a questioned synonym of *subcinctus*. Günther [(1864) 322], in a footnote, stated that since Shaw's description of *platurinus* was so indefinite and could not be readily identified as being conspecific with *subcinctus*, or any species, it could not have any nomenclatural status. He, therefore, suppressed the name, placing it as a questioned synonym of *L. subcinctus*.

Boulenger [(1893) 359] considered *platurinus* as used by Cantor (*op. cit.*) a synonym of *subcinctus;* Shaw's original proposal was apparently forgotten. Recent authors, as Boulenger, also neglected to indicate what was to be the fate of Shaw's name. Re-examining this problem (paper in press) recently, the author arrived at the conclusion that the name *subcinctus* Boie must stand as the valid name for the species herein discussed, that Shaw's name *platurinus* did not refer to a *Lycodon* at all, but to one of the kraits, genus *Bungarus*, and lastly, that Cantor had incorrectly applied Shaw's name when he substituted for *Lycodon subcinctus*.

During this time Sauvage [(1884) 144] described the species *Elapoides annulatus*, based upon a snake from Sumatra, and since considered a synonym of *subcinctus* [Smith (1943) 258]. Hallowell [(1860) 304] mentioned the species *Homalopsis buccatus* [not of Linnæus (1758)], which, according to Pope [(1935) 196], was based on a Chinese specimen of *Lycodon subcinctus*. Cope [(1895) 216, plate 24] figured the hemipenis of his species *Anoplophallus maculatus* (this figure is the only indication given for the form). Pope (*op. cit.*) stated, "Cope's [(1895) plate 24, fig. 2] figure of *Anoplophallus maculatus* is apparently an illustration of the hemipenis of *United States Natural Museum 7358* which, in turn, is the Hongkong specimen of *Lycodon subcinctus* identified by Hallowell [(1860) 504] as '*?Homalopsis buccatus*' [Stejnegar (1925) 91, Art. 16 (1926) 1–3.]"

It is interesting to note that Cope [(1893) 480] in including "*Anoplophallus* (=*Megalops* Hallow.)" in the subfamily Lycodontinæ stated that it " . . . . has a long loreal and no preocular plate, and no spines on the hemipenis." This last point is remarkable since an examination of his figure [(1895) *op. cit.*] distinctly shows the presence of spines.

The author has compared Cope's figure of the hemipenis of *Anoplophallus maculatus* with specimens of *subcinctus* in his possession, and feels that Pope (*op. cit.*) was quite correct in presuming that Cope had before him a specimen of *L. subcinctus*. Furthermore, based on the description of *Megalops maculatus* given by Hallowell [(1860) 488], Cope must have originally misidentified his specimen, for most certainly *Megalops maculatus* Hallowell is not conspecific with *Lycodon subcinctus*, nor, thus, with *Anoplophallus maculatus* Cope.

Based on the above information the following basic synonymies may be established for each of the subspecies:

**LYCODON SUBCINCTUS SUBCINCTUS Boie.**

*Lycodon subcinctus* BOIE (1826) 203 (*nomen nudum;* type locality, Java); (1827) column 551.

*Elapoides annulatus* SAUVAGE (1884) 144 (type locality, Sumatra.).

**LYCODON SUBCINCTUS MACULATUS (Cope).**

*Homalopsis buccatus* (not of Linnæus) HALLOWELL (1860) 504 (misidentified specimen from Hongkong).

*Anoplophallus maculatus* COPE (1895) 216, *pl. 24, fig. 2,* (type locality, Hongkong) [not *Megalops maculatus* Hallowell (1860)].

**LYCODON SUBCINCTUS SEALEI subsp. nov.**

*Ophites subcinctus* TAYLOR (1922) 124.

## DISTRIBUTIONAL NOTES

A search of the literature reveals that the specimen listed under the paratypic material of *sealei, United States National Museum 130246,* represents the first record of *L. subcinctus,* and in fact, the only other species of *Lycodon* other than *albofuscus* heretofore recorded from the Mt. Kinabalu Region of Borneo [see Smith (1931)]. This fact is rather interesting when one considers that the widely distributed *L. aulicus* has never been reported from this region, nor in fact from Palawan Island, one of the presumed major routes of entry of the Malayan fauna into the Philippines [Inger (1954) 492], although the species is found throughout the larger islands of the Philippines, as well as in Sarawak, and more southern localities in Borneo. *L. subcinctus,* on the other hand, although being widely distributed throughout Indonesia, Malaya, Siam, Indo-china, China, and Borneo, apparently is restricted to Palawan Island in the Philippines.

A further record, and also one of great interest is that of *Museum of Comparative Zoology 2236,* a specimen identified as *Lycodon s. subcinctus* and reputedly coming from Pondicherry,

India. This is of particular interest since only one other record of *subcinctus* from India exists, and this being from the northern part, Bengal [Schlegel (1836) 117]. Smith [(1943) 258] limits the western range of *subcinctus* to Siam.

The individual on hand gives ventral, subcaudal and total counts (v + c) of 202, 74, and 276 respectively. The specimen apparently has been completely bleached, half of the lower jaw is missing, and the maxillaries are in too poor a condition for study. The scale pattern is typical for the species, however.

The author is somewhat skeptical of the locality data, and presumes that the individual was perhaps obtained from Indochina. According to Loveridge (personal correspondence) this specimen "was just one of an extensive collection of snakes received in an exchange from the 'Jardin des Plantes through A. A. Duméril'. ( . . . . . the material comes from every corner of the French Colonies.)" Loveridge mentioned that many of the localities (in the exchange material) were vague; also, the possibility exists that it (the specimen) "had been kept alive in their zoo resulting in confusion of locality."

In any event, considering the fact that the species has never been taken in India (excepting perhaps Schlegel's reference, which is also doubtful) nor from Burma, it seems likely that an error has been made, and that the locality should be rejected.

ACKNOWLEDGMENTS

The author wishes to express his gratitude to Mr. Arthur Loveridge of the Museum of Comparative Zoology of Harvard University for the loan of specimens under his care and for information regarding the "Indian" example of *subcinctus,* and to Dr. Doris M. Cochran of the United States National Museum and Mr. Joseph R. Slevin of the California Academy of Sciences for the loan of specimens.

He also wishes to thank Professor George S. Myers of the Natural History Museum of Stanford University for his criticism of the manuscript.

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# JAPANESE PSYCHODIDÆ, III

## NEW OR LITTLE-KNOWN MOTH FLIES, WITH DESCRIPTIONS OF TEN NEW SPECIES *

By Masaaki Tokunaga and Etsuko Komyo
*Entomological Laboratory, Saikyo University, Kyoto, Japan*

FIFTY-TWO TEXT FIGURES

In two preceding papers, we reported nineteen Japanese species of moth flies; those belonged to *Sycorax, Psychoda, Trichopsychoda, Brunettia,* and *Pericoma.* In this paper, we present other twelve species, including a species of *Trichomyia* Haliday, six species of *Telmatoscopus* Eaton, four species of *Pericoma* Walker and an additional species of *Psychoda* Latreille. Of these species, ten are quite new to science and a new *Trichomyia* especially is most notable, as only a single fossil species, *T. swinhoi* Cock., from amber of Burma has been known from eastern Asia.

*Abbreviation.*—TTR is tibiotarsal ratio, relative length of tibia to that of first tarsal segment of the same leg. TR is tarsal ratio, relative length of first tarsal segment to that of second tarsal segment of the same leg. RR is radial ratio, relative length of wing vein $R_{2+3}$ to that of $R_2$. The morphological terminology used in this paper is mainly adopted from that of Dr. P. Freeman (1950).

In the text figures, the scales, hairs and colored markings are all omitted.

We are greatly indebted to Prof. Dr. Teiso Esaki of Kyushu University, Fukuoka; Dr. Syusiro Ito of Naniwa University, Osaka; Mr. Mitsuhiro Sasakawa of Saikyo University, Kyoto; Mr. Yukio Shogaki of Far East Medical Research Unit 8003rd Army Unit, Kyoto, and Miss Ito Terashima of Yamada City, Mie-ken, for their cordial helps in collecting these small moth flies which are rather difficult to find (August 4, 1954).

The Japanese species of the Psychodidæ studied in our entomological laboratory are listed as follows:

### PHLEBOTOMINÆ

*Phlebotomus squamirostris* Newstead

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* Contribution from the Entomological Laboratory, Saikyo University, Kyoto. No. 36.

## TRICHOMYIINÆ

*Sycorax japonicus* Tokunaga et Etsuko
*Trichomyia itocoæ* Tokunaga et Etsuko

## PSYCHODINÆ

*Psychoda alternata* Say
*Psychoda severini* Tonnoir
*Psychoda setigera* Tonnoir
*Psychoda criminea* Eaton
*Psychoda phalænoides* Eaton
*Psychoda malleola* Tokunaga et Etsuko
*Psychoda itoco* Tokunaga et Etsuko
*Psychoda longiseta* Tokunaga et Etsuko
*Psychoda motoharui* Tokunaga et Etsuko
*Psychoda fungicola* Tokunaga
*Trichopsychoda shogakii* Tokunaga et Etsuko
*Trichopsychoda lepida* Tokunaga et Etsuko
*Pericoma shikokuensis* Tokunaga et Etsuko
*Pericoma yanoi* Tokunaga et Etsuko
*Pericoma sasakawai* Tokunaga et Etsuko
*Pericoma omogoensis* Tokunaga et Etsuko
*Pericoma longicellata* Tokunaga et Etsuko
*Pericoma reticulatipennis* Tokunaga et Etsuko
*Pericoma denticulatistyleta* Tokunaga et Etsuko
*Pericoma furcastyla* Tokunaga et Etsuko
*Brunettia spinistoma* Tokunaga et Etsuko
*Brunettia ishiharai* Tokunaga et Etsuko
*Telmatoscopus saxicolus* Tokunaga et Etsuko
*Telmatoscopus kii* Tokunaga et Etsuko
*Telmatoscopus frondeus* Tokunaga et Etsuko
*Telmatoscopus albipunctatus* Willistone
*Telmatoscopus nigrescens* Tokunaga et Etsuko
*Telmatoscopus spinitibialis* Tokunaga et Etsuko

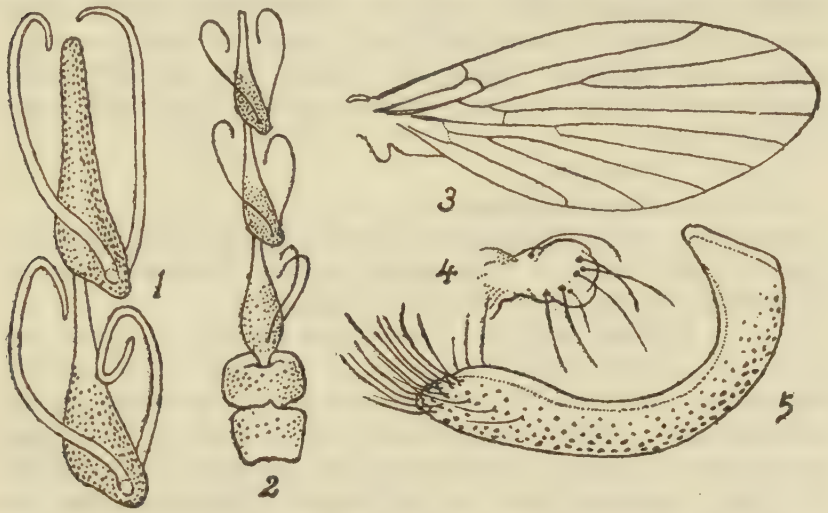
**TRICHOMYIA ITOCOÆ Tokunaga et Etsuko, sp. nov.**

This peculiar species was collected at light together with *Psychoda setigera* Tonnoir along a large mountain stream.

*Male.*—Body about 1.2 millimeters long, with very long antennæ showing an appearance of a gall midge and entirely pale brownish gray.

Head oval but bluntly produced dorsad. Eyes bare, reniform, very widely separated above as wide as half of vertical length of eyes. Maxillary palpi apparently 3–segmented (14:8:7.5); first segment large, oval; second segment small, oval, slightly produced beyond insertion of last segment. Antennæ (Figs. 1 and 2) 15–segmented, very long; first segment short, as long as second and discoidal; second segment somewhat flattened and oval in lateral aspect; flagellar segments elongated and each with a long neck-part; first flagellar segment

bottlelike; following segments also bottlelike but asymmetrical one side of basal portion being produced backwards beyond basal articulation; ultimate segment elongated distad and entirely setigerous; flagellar segments, except for ultimate, swollen on basal half and highly setigerous and distal neck parts very slender and bare; ascoids very strong, dark, simple, far longer than the segment, curved or coiled on apical parts and two on each segment grown on basal produced part; verticils very finely plumose and thickly grown on basal swollen part. Relative lengths of basal and distal six segments 12:12:26:25:25:25 and 25:26:26:25:25:28 respectively.




*Trichomyia itocoæ* Tokunaga et Etsuko, sp. nov.

FIG. 1. Distal two antennal segments of male.
2. Basal five antennal segments of male.
3. Wing of male.
4. Style of male hypopygium.
5. Cercus of male hypopygium.

Legs normal in structure and showing following proportional lengths: in fore legs 18:21:12.5:5:4:3:4, in middle legs 23:23:12:6.5:4:3:4, and in hind legs 23:32:11:5.5:3:4:3. TRR and TR of hind legs about 2.9 and 2.0 and those of fore legs 1.7 and 2.5 respectively. Wings (Fig. 3) 1.47 × 0.6 millimeters, oval in shape, with hairs rather sparse; membrane pale brownish hyaline; tip of wing round. Venation: Sc. forked at distinctly beyond base of Rs and its two arms curved, fuscus and subequal in length to each other, Rs rather long,

far longer than width of anterior basal cell (23:13), $R_{2+3}$ a little shorter than half of $R_2$ (18:34), $R_3$ ending just before tip of wing, $R_{4+5}$ unbranched and ending beyond tip of wing, forking point of $M_{1+2}$ just before tip of $Cu_1$ and before anterior forking point, $M_{3+4}$ short, slightly longer than Rs (30:23) and basal connection of $M_{3+4}$ obscure, basal short section of $M_2$ obscure and $M_2$ angulated near by base.

Hypopygium (Figs. 4 and 5) characteristic; coxites and styles somewhat reduced; coxites membranous, without ordinary structure and apparently atrophied; styles reduced into griplike small projection each of which bears about seven setæ; cerci highly developed, stout, upcurved, setigerous entirely, with chitinized ridge on concave side of each cerci; apical ends of cerci without special retinacula but with many ordinary setæ.

*Female.*—Unknown.

*Locality.*—Mie-ken, Japan.

*Holotype.*—Male mounted in Gater's solution; Aso, Mie-ken; June 11, 1954 (*Miss I. Terashima,* at light); deposited in the entomological laboratory, Saikyo University.

This is the first record of *Trichomyia* not only in Japan but also from eastern Asia, except for a Burmese fossil species. The present species is highly specific in the structure of the antennæ and hypopygium distinctly differing from all known species of the genus. We take great pleasure in dedicating this highly peculiar moth fly to Miss Ito Terashima, who has kindly collected the new species.

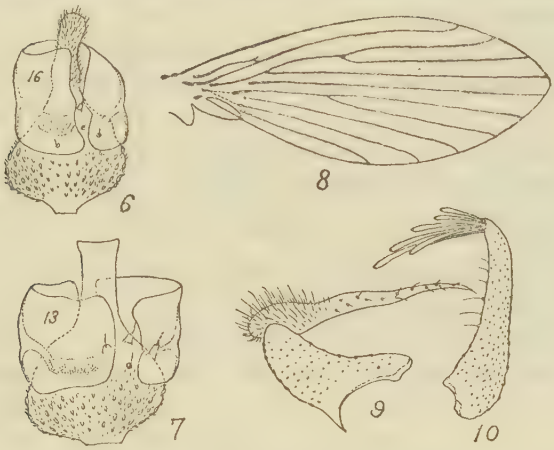
**TELMATOSCOPUS SAXICOLUS Tokunaga et Etsuko, sp. nov.**

This is a small whitish gray species, found in a dark crevice of a large rock along a mountain rapid stream.

*Male.*—Body about 1.5 millimeters long, entirely whitish gray and without distinct colored pattern.

Head round, with frontal scaly region triangular. Eyes broadly contiguous above with each other. Mouth parts small; maxillary palpi 4–segmented (15:32:30:47). Antennæ (Figs. 6 and 7) 16–segmented; first segment short, subcylindrical; flagellar segments flask-shaped, each with a pair of large collarlike ascoids around neck part and many verticils on basal half of swollen part; ultimate segment with an apical fingerlike projection; relative lengths of basal and distal five segments about 25:14:25:30:22 and 27:25:14:9:11 respectively.

Legs unicolored; TTR and TR of hind legs about 2.75 and 2.65 respectively. Wings (Fig. 8) about 1.93 × 0.75 millimeters, somewhat rhombic, with tip not pointed, veins brown and




*Telmatoscopus saxicolus Tokunaga* et Etsuko, sp. nov.

FIG. 6. Ultimate antennal segment of male.
7. 13th antennal segment of male.
8. Wing of male.
9. Coxite and style of male hypopygium.
10. Cercus of male hypopygium.

membrane milky white. Venation: base of $R_{2+3}$ beyond origin of $R_5$, RR about 0.4, $R_{2+3+4}$ about one-third of $R_{2+3}$ in length (7:21), $R_4$ straight and ended slightly before wing tip, $R_5$ straight, ended slightly beyond wing tip and its basal connection obscure, $Cu_1$ not connected with $M_4$ and ended beyond two forks, basal connection of $M_3$ obscure, forking point of $R_{2+3}$ slightly beyond that of $M_{1+2}$.

Hypopygium (Figs. 9 and 10) slender; coxite rather slender, expanded at base, scaly on lateral side and with about ten small setæ on mesal side at base, style very slender, sharply pointed, clawlike, setigerous and scaly at base and with minute setæ on apical two-thirds; cercus shorter than style, entirely scaly, slightly swollen at base and with six slender retinacula.

*Female.*—Unknown.

*Locality.*—Honshu, Japan.

*Holotype.*—Male mounted in Gater's solution; Osugi-tani, Mie-ken, June 10 to 12, 1952 (*M. Tokunaga*).

*Paratopotypes.*—Many males, alcoholic and dry; June 10 to 12, 1952 (*M. Tokunaga*).

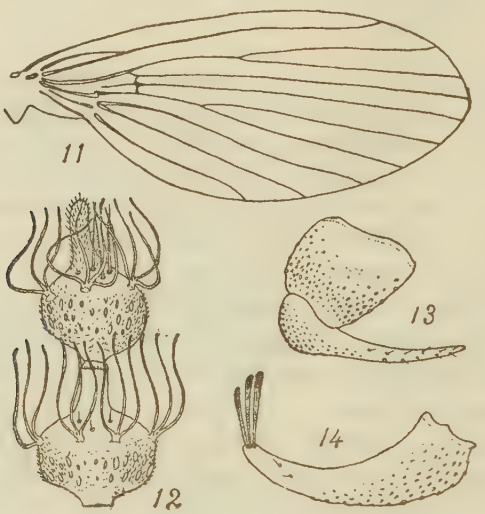
*Type specimens.*—Deposited in the entomological laboratory Saikyo University.

This species is quite specific in the structure of the ascoids of the male antennæ. The wing venation is somewhat similar to that of *T. ambiguus* Eaton but the male hypopygium is different and rather resembles to that of *T. britteni* Tonnoir. This species is named in the relation to its habitat.

**TELMATOSCOPUS KII Tokunaga et Etsuko, sp. nov.**

This species was found in a dark small cave of a large rock in a mountain rapid stream.

*Male.*—Body about 2 millimeters long, white, without distinct colored marking, with scales and hairs rather scarce.




*Telmatoscopus kii* Tokunaga et Etsuko, sp. nov.

FIG. 11. Wing of male.
12. Distal two antennal segments of male.
13. Coxite and style of male hypopygium.
14. Cercus of male hypopygium.

Head with setigerous area of front oval. Eyes broadly contiguous above with each other. Maxillary palpi 4–segmented (25:45:43:46). Antennæ (Fig. 12) 16–segmented; first segment not longer than twice of second; second sub-

spherical; flagellar segments flask-shaped, each with many verticils and several three-branched ascoids; basal flagellar segments each with ten ascoids, penultimate with six and ultimate with four; ascoids of ultimate segment sometimes four-branched; proportional lengths of six basal and eight distal segments about 23:14:25:24:24:24 and 22:20:20:19:18:16:14:13.

Hind legs broken off. Wings (Fig. 11) about 2.2 × 0.9 millimeters, with tip not pointed, veins pale brown, membrane hyaline, but costal cell yellowish pale brown. Venation: origin of $R_{2+3}$ slightly before that of $R_{4+5}$, $R_{2+3}$ about two-thirds as long as $R_2$ (32:54), RR about 0.59, $R_{4+5}$ very short and shorter than width of anterior basal cell, $R_4$ ended at tip of wing, $R_5$ with a short spurlike vein at basal angle, $Cu_1$ separated from forking point between $M_3$ and $M_4$ and ended at level of forking point of $R_{2+3}$, forking point of $M_{1+2}$ distinctly before that of $R_{2+3}$.

Hypopygium (Figs. 13 and 14) with coxites basally contiguous with each other and scaly on apical half; styles far longer than coxites, clawlike, slightly swollen at base, scaly on this basal swelling and with minute setæ on apical half; cerci evenly curved, taper, not suddenly swollen at base and each with three slender retinacula at tip.

*Female.*—Unknown.

*Locality.*—Honshu, Japan.

*Holotype.*—Male.

*Paratopotypes.*—Two males.

*Type specimens.*—Mounted in Gater's solution; Osugi-tani, Mie-ken; June 10 to 12, 1952 (*M. Tokunaga*): deposited in the entomological laboratory, Saikyo University.

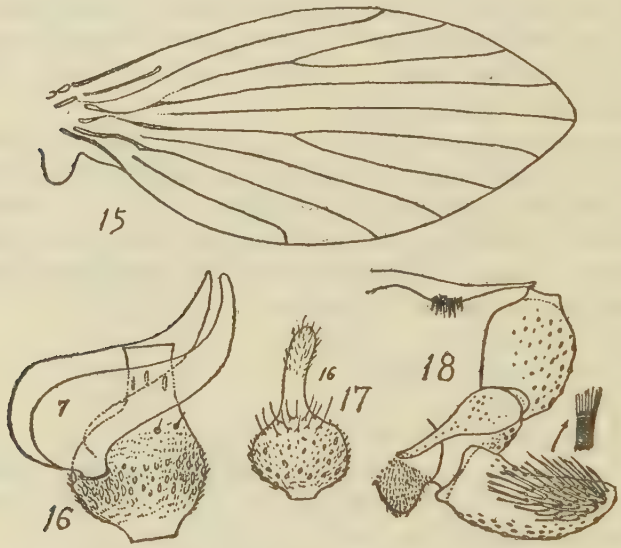
This new species is closely allied to an Indian species, *T. indicus* Feuerborn, but in the allied species, forking points of $R_{2+3}$ and $M_{1+2}$ are opposite to each other and the styles and cerci of the male hypopygium are strongly angulated differing from those of the present species. *T. saxicolus* Tokunaga et Etsuko is somewhat related to the present species, but in the related species the costal cell of the wing is not tinged and the structures of the antennal ascoids and the male hypopygium are quite different from the present species. Another allied species may be *T. autumnalis* Bank, but in the allied species the wing venation is distinctly different. The species name is related to the locality of this fly, Kii Peninsula of Honshu.

**TELMATOSCOPUS FRONDEUS Tokunaga et Etsuko, sp. nov.**

This is a dark species collected by a light trap set along a marshy shallow pond.

*Male.*—Body entirely black, about 1.7 millimeters long.

Head round, with frontal scaly region somewhat hemicircular. Eyes more narrowly separated above than a facet. Maxillary palpi 4–segmented (15:42:34:44). Antennæ (Figs. 16 and 17) 16–segmented; first segment somewhat cylindrical and about twice as long as second; second segment subspherical; flagellar segments flask-shaped, each with a rather short neck part, many verticils and a pair of large flat leaflike or hoodlike ascoids, but ultimate segment without ascoids, but with many




*Telmatoscopus frondeus* Tokunaga et Etsuko, sp. nov.

FIG. 15. Wing of male.
16. 7th antennal segment of male.
17. Ultimate antennal segment of male.
18. Hypopygium of male.

verticils and a slender fingerlike pubescent projection at tip; relative lengths of antennal segments about 25:13:21:21:21:21:21:21:21:20:19:18:18:17:16:15.

TTR and TR of hind legs about 2.65 and 2.83 respectively. Wings (Fig. 15) about $1.95 \times 0.87$ millimeters, with tip pointed, membrane dark brown and veins dark. Venation:

forking points of $R_{2+3}$ and $M_{1+2}$ opposite to each other and at level of end of $Cu_1$, base of $R_{2+3}$ slightly before origin of $R_5$ and $R_{2+3}$ a little shorter than $R_2$ (28:33), RR about 0.85, basal connection of $R_5$ obscure and $R_5$ ended at tip of wing, base of $M_3$ atrophied, $Cu_1$ not connected with $M_4$.

Hypopygium (Fig. 18) massive; coxites widely separated from each other, entirely scaly and slightly longer than width; styles small, as long as coxites, not scaly, swollen on basal half, narrow on distal half and with many minute setæ; cerci stout, curved, not swollen basally, scaly on ventral side and with many brushlike retinacula on apical half of dorsal side; caudal edge of abdominal dorsal side thickened and with a pair of groups of small spinules.

*Female.*—Unknown.

*Locality.*—Honshu, Japan.

*Holotype.*—Male mounted in Gater's solution: Midoro-ike, Kyoto City; July 8, 1952 (*Mr. Y. Shogaki*); deposited in the entomological laboratory, Saikyo University.

This species is closely related to *T. advenus* Eaton, however the related species is provided with narrower wings, brown vesture of scales on body, longer neck parts of antennal flagellar segments and flat ascoids which are coiled downwards at tip, differing from the new species. The species name is related to the leaflike ascoids of antennæ.

**TELMATOSCOPUS ALBIPUNCTATUS** Williston.

This species is comparatively common in southern parts of Japan and known as a myiasis-producer causing human intestinal myiasis in Japan and the immature stages and systematic diagnosis of this species were also reported by the senior author (1953). At present we intend to supplement the previous report with additional observations.

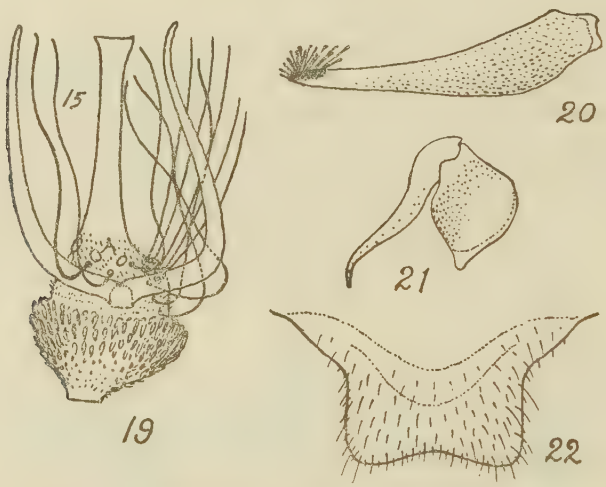
*Male.*—Body about 4 to 5 millimeters long, with dark and white vesture of scales, showing mottled appearance.

Eyes narrowly separated above as wide as a facet. Maxillary palpi 4-segmented (30:110:70:85). Antennæ (Fig. 19) 16-segmented; flagellar segments each with a long neck part, a pair of long U-shaped ascoids and many filiform sensillæ; proportional lengths of antennal segments about 33:27:44:40: 41:41:41:41:41:41:41:41:41:40:39:36.

TTR and TR of hind legs about 2.6 and 3.2 respectively; all legs generally dark but tibiæ with scattered white scales and narrowly white at distal end; first tarsal segments also

narrowly white at distal end. Wings about $3.7 \times 1.8$ millimeters, pointed at tip, dark with many white tufts of hairs as reported in Tokunaga's report. Venation: $R_{2+3}$ arose before origin of $R_5$ and about half as long as $R_2$, RR about 0.5, $R_{4+5}$ a little shorter than twice the width of anterior basal cell (12:7), $R_5$ ended at tip of wing, forking point of $R_{2+3}$ far beyond that of $M_{1+2}$ and both forks far before tip of $Cu_1$, $Cu_1$ separated from $M_4$ at base.

Hypopygium (Figs. 20 and 21) with coxites and styles small; coxite as long as width and scaly on apical part; style slender, undulated, without scales, but with many minute puncturelike sensillæ; cercus almost straight, taper, scaly and with about ten or more small retinacula.




*Telmatoscopus albipunctatus* Williston.

FIG. 19. 15th antennal segment of male.
20. Cercus of male hypopygium.
21. Coxite and style of male hypopygium.
22. Subgenital lobe of female.

*Female.*—Generally as in male. Eyes separated above as wide as two facets. Palpal formula of maxilla about 30:112:72:85. Antennæ as in male, but flagellar ascoids not bifid but all simple. TTR and TR of hind legs about 2.7 and 3.0 respectively. Wings about $3.9 \times 1.8$ millimeters; venation: $R_{2+3}$ shorter than half of $R_2$ (48:105), RR about 0.46, $R_{4+5}$ a little longer than width of anterior basal cell (10:8), distal

section of $M_{1+2}$ about half as long as $R_{2+3}$ (25:48). Lobe of subgenital plate (Fig. 22) small, very shallowly concave at caudal margin and not distinctly constricted at base, its basal width about twice the length.

*Specimens.*—Many males and females, mounted in Gater's solution, dry and alcoholic; Osaka City, Honshu; October 17, 1952 (*Dr. T. Esaki*); Fukuoka City, Kyushu; October 19, 1944 (*Mr. S. Ito*); deposited in the entomological laboratory, Saikyo University.

This species is tropical in distribution and may be a new arrival in Japan.

**TELMATOSCOPUS NIGRESCENS Tokunaga et Etsuko, sp. nov.**

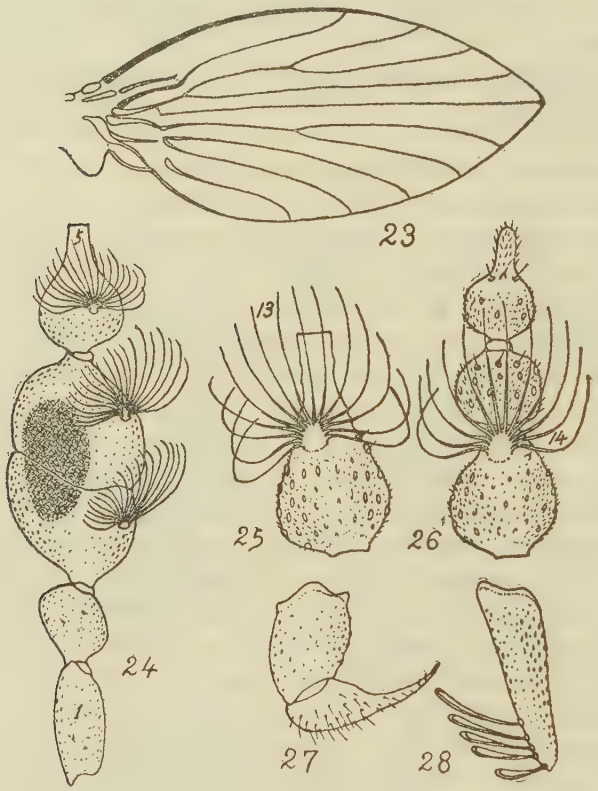
This is a black species collected at light.

*Male.*—Body about 1.3 millimeters long, with black vesture of scales and without white scales.

Eyes contiguous above. Front with scaly region semicircular. Maxillary palpi 4–segmented (30:35:35:30). Antennæ (Figs. 24 to 26) 16–segmented; first segment somewhat spindle- or cask-shaped and a little longer than second subspherical segment; flagellar segments each with a pair of large palmate ascoids, which is finely branched at base into about 24 files on basal segments and into a dozen files on 14th segment; first and second flagellar segments united into a large node; following 11 segments bulbous and their neck parts shorter on basal segments and elongated on distal segments and on 13th segment attaining a half length of the segment; 14th segment subspherical, without neck part but with a pair of palmate ascoids and many verticils; 15th small, not longer than width, without ascoids and neck part, but with about 20 verticils; ultimate segment with an apical pubescent projection and about ten verticils, but without ascoids. Relative lengths of basal and distal five antennal segments about 22:18:32:29:27.5 and 22:22:21:19:21.

Hind legs with TTR about 2.85 and TR about 2.17. Wings (Fig. 23) $1.8 \times 0.8$ millimeters, with broad scales on basal half and slender scales on distal half, tip pointed, membrane dark brown, especially dark on costal cell and anal area. Venation: $R_5$ arose before base of $R_{2+3}$, extended straight and ended just beyond tip of wing but apparently at tip, $R_{2+3+4}$

about two-fifths to one-third in length of $R_{2+3}$, $R_2$ about 1.5 times as long as $R_{2+3}$, RR about 0.69 (0.65 to 0.73), forking point of $R_{2+3}$ almost opposite to or just before that of $M_{1+2}$ and at level of tip of $Cu_1$, basal end of $M_{3+4}$, not connected with $M_{1+2}$ or with $R_5$, $Cu_1$ slightly separated from forking point of $M_{3+4}$ at base.




*Telmatoscopus nigrescens* Tokunaga et Etsuko, sp. nov.

FIG. 23. Wing of male.
24. Basal five antennal segments of male.
25. 13th antennal segment of male.
26. Distal three antennal segments of male.
27. Coxite and style of male hypopygium.
28. Cercus of male hypopygium.

Hypopygium (Figs. 27 and 28) with coxites subcylindrical, entirely scaly and shorter than styles; styles slightly curved, basally thickened and setigerous, very slender on apical half;

cerci straight, comparatively short, only a little longer than styles, scaly entirely and provided with five retinacula on apical one-third.

*Female.*—Unknown.

*Locality.*—Honshu, Japan.

*Holotype.*—Male mounted in Gater's solution.

*Paratopotype.*—Male mounted in Gater's solution.

*Type specimens.*—Hachijo, Kyoto City; August 28, 1952 (*M. Tokunaga,* at light; deposited in the entomological laboratory, Saikyo University.

The species name is related to the entirely black color of this fly. The antennal ascoids of this species are somewhat similar to those of *T. caliginosus* Eaton but porthole organs of flagellar segments are entirely absent distinctly differing from the allied species.

**TELMATOSCOPUS SPINITIBIALIS Tokunaga et Etsuko, sp. nov.**

This is a black species, covered with black vesture of dense scales. The male is provided with a long recurved spine at tip of each middle leg and both sexes are provided with intimately united two basal flagellar segments of antennæ.

*Male.*—Body about 1.5 millimeters long and entirely black.

Head oval, slightly wider than length; frontal scaly part extended dorsad between eyes. Eyes widely separated above from each other as wide as three facets. Papal formula of maxilla about 17:32:40:42. Antennæ (Figs. 29 to 31) 16–segmented; first segment somewhat barrel-shaped; second subspherical and about three-fifths as long as first; first flagellar segment united with following segment and without ascoids; second flagellar segment and following 11 segments flask-shaped, each with a neck part and many filiform ascoids which are arranged into two circular lines around the apical area of basal subspherical part and ascoids which belong to the basal line extended proximad along wall of basal part and those of apical line extended distad and slightly curved; neck parts of flagellar segments slightly longer than basal part, but that of second slightly shorter and that of small penultimate segment far shorter than basal subspherical part; ultimate segment far smaller than penultimate, subspherical, with a small apical tubercle, many verticils, but without ascoids; apical tubercle with two small setæ at tip and not

pubescent; proportional lengths of antennal segments about 20:15:12:30:34:33:34:32:32:31:30:30:30:28:18:10.

TTR and TR of hind legs about 2.6 and 2.1 respectively. Tibiæ of middle legs (Fig. 32) each with a long apical spine on apical projection; this spine recurved backwards at just before tip of first tarsal segment and ended at middle of this tarsal segment. Wings (Fig. 35) about 1.9 × 0.7 millimeters, with veins dark brown, membrane pale brown, tip pointed, scales on veins all slender and hairlike. Venation: $R_5$ arose far before origin of $R_{2+3}$, extended straight and ended at just tip of wing, $R_{2+3+4}$ about two-thirds long of $R_{2+3}$, $R_{2+3}$ very short, about one-fourth of $R_2$, RR about 0.26, $M_{1+2}$ about a half of $M_1$ in length, $M_{3+4}$ apparently absent, two arms being diverged directly at base, $Cu_1$ not connected with median veins, forking point of $R_{2+3}$ slightly before that of $M_{1+2}$ and far before tip of $Cu_1$.

Hypopygium (Figs. 33 and 34) with cerci and styles small; cerci setigerous, swollen and semispherical at base and rodlike or clublike on apical two-thirds, each with two small leaflike or scalelike retinacula at tip; coxites as long as cerci, longer than width and entirely scaly; styles beaklike, far shorter than coxites, scaly on basal swelling and each with two rather long setæ before tip.

*Female.*—Generally as in male, except for usual sexual differences. Eyes separated above as wide as three facets. Maxillary palpi 4–segmented (13:28:35:35). Antennæ (Figs. 36 and 37) as in male, but ascoids distinctly different; 4th to 15th segments each with a pair of bifid U-shaped ascoids, 16th segment with about 12 slender filiform sensillæ around apical tubercle; proportional lengths of antennal segments about 14:12:9:18:20:20:20:20:19:18:16:15:14:14:10:8. TRR and TR of hind legs about 2.75 and 1.63 respectively. Peculiar tibial spines absent. Wings about 1.9 × 0.7 millimeters, relative lengths of $R_{2+3+4}$, $R_{2+3}$ and $R_2$ about 9:15:42, RR about 0.36. Subgenital plate with caudal lobe (Fig. 38) very broad, transverse, not distinctly bilobate.

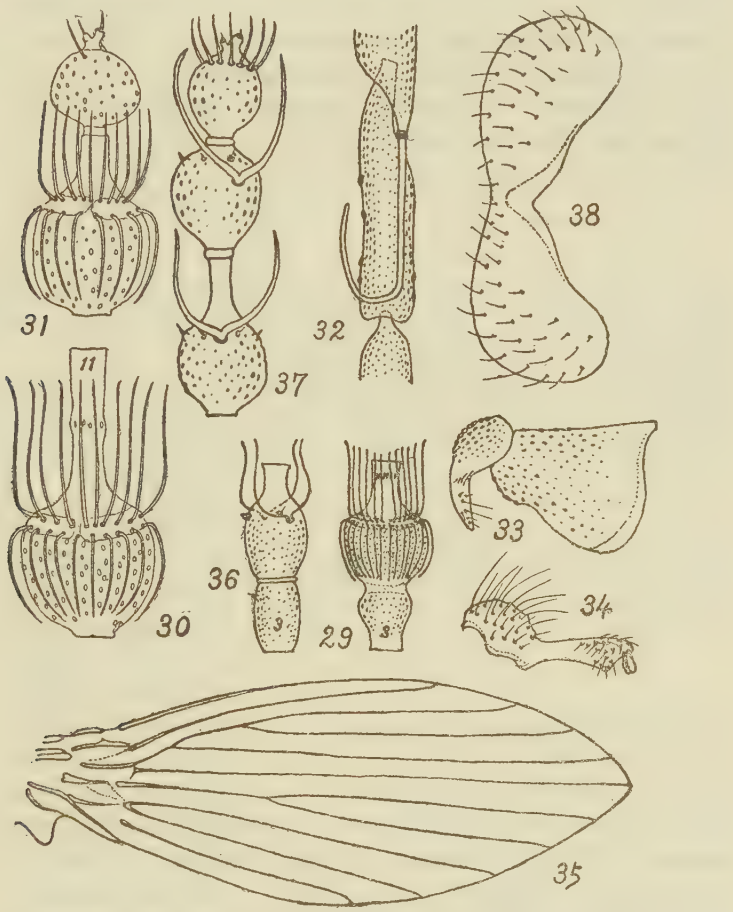
*Locality.*—Honshu and Hokkaido, Japan.

*Holotype.*—Male mounted in Gater's solution; Midoro-ike, Kyoto City; July 8, 1952 (*Mr. Y. Shogaki*, at light).

*Allotopotype.*—Female mounted in Gater's solution; August 16, 1952 (*Mr. Y. Shogaki*, at light).

*Paratypes.*—Many males and females mounted in Gater's solution; Midoro-ike, Kyoto City; August 16, 1952 and June to August, 1953 (*Mr. Y. Shogaki,* at light). A male; Ashoro, Hokkaido; June 16, 1954 (*Mr. M. Sasakawa*).

*Type specimens.*—Deposited in the entomological laboratory, Saikyo University.




*Telmatoscopus spinitibialis* Tokunaga et Etsuko, sp. nov.

Fig. 29. 3rd and 4th antennal segments of male.
30. 11th antennal segment of male.
31. Distal two antennal segment of male.
32. Apical spine of middle tibia of male.
33. Coxite and style of male hypopygium.
34. Cercus of male hypopygium.
35. Wing of male.
36. 3rd and 4th antennal segments of female.
37. Distal three antennal segments of female.
38. Subgenital lobe of female hypopygium.

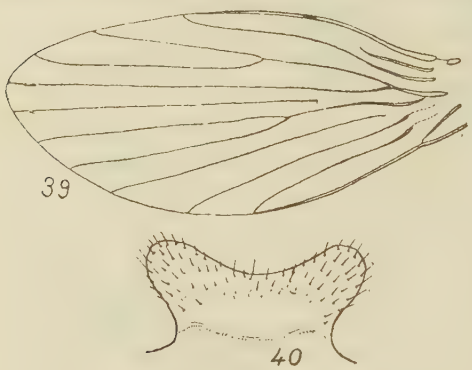
This species is named in the relation to the peculiar long tibial spines of the middle legs of the male. This species is closely related to *T. snowhilli* Rosario in the structures of the male hypopygium and the male antennæ and the wing venation, but details of these organs are somewhat different as follows: in the related species, the cerci of the male hypopygium are provided with three retinacula, the sensory files of basal rows of ascoids of the flagellar segments are extended straight proximad and the wings are more pointed at tip, the tips of veins $R_4$ and $M_1$ are opposite to each other and the tip of $R_1$ is before the level of the tip of $M_4$.

**PERICOMA LONGICELLATA Tokunaga et Etsuko, sp. nov.**

This is a black species and provided with pale ringed on legs and elongated anterior basal cells of wings.

*Female.*—Body including wings entirely black but base of tibia, both ends of first tarsal segment and entire length of second tarsal segment of each leg paler.

Head longer than width, occipital region with a blunt small tubercle; front with an oval scaly region. Eyes separated above as wide as three facets. Palpal formula of maxilla about 25:35:33:43. Antennæ 16–segmented; first segment cylindrical, fully twice as long as width but shorter than twice of second segment (26:16); second segment subspherical, as long as first flagellar segment (16:15); flagellar segments elongated oval or fusiform and each with a pair of slightly curved simple ascoids; distal three segments somewhat different from the preceding segments; 14th segment elongated oval, small and without neck part, 15th oval, small and also without neck part, ultimate segment with a long apical projection; relative lengths of basal six and distal eight antennal segments about 26:16:15:11:12:12 and 12:11:10:10:10:7:7:10 respectively.




*Pericoma longicellata* Tokunaga et Etsuko, sp. nov.

FIG. 39 Wing of female.
40. Subgenital lobe of female hypopygium.

Thorax dark brown. Hind legs with TTR and TR about 2.3 and 2.6 respectively. Wings (Fig. 39) about 1.75 × 0.75 millimeters, with tip not pointed. Venation: $R_{2+3}$ arose far before origin of $R_5$ and far longer than a half of $R_2$ (27:39), RR about 0.7, $R_{4+5}$ comparatively long and about a half of $R_{2+3}$ (14:27), anterior basal cell very long and $R_{4+5}$ a little longer than four times of width of the cell (14:3), $R_4$ ended just before wing tip, $Cu_1$ separated from $M_4$ at base, forking point of $R_{2+3}$ beyond that of $M_{1+2}$ and at level of tip of $Cu_1$.

Ovipositor horny and normal. Lobes of subgenital plate (Fig. 40) short, round at tip, divergent from each other, distinctly constricted at their common base; caudal incision evenly and shallowly concave.

*Male.*—Unknown.

*Locality.*—Honshu, Japan.

*Holotype.*—Female mounted in Gater's solution; Midoro-ike, Kyoto City; July 13, 1953 (*Mr. Y. Shogaki,* by light trap); deposited in the entomological laboratory, Saikyo University.

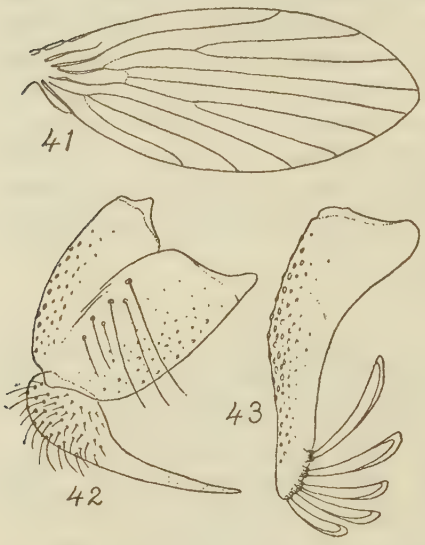
This species is quite peculiar in possession of the very long anterior basal cell of the wing. *Clytocerus* Eaton shows similar long basal cell but in this genus the forking point of $R_{2+3}$ is situated before that of $M_{1+2}$ and the male antennæ 15-segmented. The male of this species is not known as yet and at present it may be best to refer this species to the genus *Pericoma* Walker. The species name is related to the long anterior basal cell of the wing.

**PERICOMA RETICULATIPENNIS Tokunaga et Etsuko, sp. nov.**

This species is white and provided with dark markings on the wings and legs.

*Male.*—Body about 1.8 millimeters long, mainly snowy white. Legs white, but distal three tarsal segments of all legs dark and also distal half of hind tibiæ and hind first tarsal segments dark except for their white extreme distal ends. Wings mainly snowy white, but sub-basal area dark, a transversal band extending from apical part of $R_1$ to that of $M_4$ dark, distal parts of all main veins dark; fringe of hairs on anterior wing margin mainly white, that on posterior margin mainly dark, that of apical half of wing mainly white, but dark and white parts alternatively arranged.

Head with eyes separated above as wide as three facets. Antennæ 16–segmented, normal as in other *Pericoma* species; first basal segments short, subcylindrical; second subspherical; third and following segments subfusiform, but distal flagellar segments somewhat oval; proportional lengths of basal and distal six segments about 18:15:12:12:11:10 and 8:7:7:6:6:9. Maxillary palpi 4–segmented (15:25:28:37).




*Pericoma reticulatipennis* Tokunaga et Etsuko, sp. nov.

FIG. 41. Wing of male.
42. Coxite and style of male hypopygium.
43. Cercus of male hypopygium.

TTR and TR of fore legs about 1.94 and 2.46 and those of hind legs about 2.39 and 2.40 respectively. Wings (Fig. 41) about 2.3 × 0.9 millimeters, somewhat oval, with tips not pointed. Venation: $R_{2+3}$ arose before base of $R_5$ and its base obscure, RR about 0.61, $R_{4+5}$ subequal to or a little longer than width of anterior basal cell, forking points of $R_{2+3}$ and $M_{1+2}$ opposite to each other at level of tip of $Cu_1$, $R_4$ ending just before tip of wing, origin of $M_2$ obscure and somewhat angulated, $Cu_1$ arose from forking point between $M_3$ and $M_4$ but its base somewhat obscure.

Hypopygium (Figs. 42 and 43) large; coxite conical slightly longer than style, setigerous on lateral and dorsal sides, with several long setæ on ventral side; style sharply pointed, claw-shaped, swollen basally and setigerous; cercus longer than coxite, stout, gradually thickened basally and with five strong retinacula on apical part.

*Female.*—Coloration similar to that of male or slightly dark markings of legs more distinct. Body length about 1.2 millimeters. Antennæ broken off.

*Locality.*—Hokkaido, Japan.

*Holotype.*—Male mounted in Gater's solution; Nukabira, Hokkaido; June 13, 1954.

*Allotype.*—Female dry; Akan, Hokkaido; June 22, 1954.

*Type specimens.*—Deposited in the entomological laboratory, Saikyo University; collected by Mr. M. Sasakawa.

This species is closely allied to an European species, *P. gracilis* Eaton, especially in the coloration and venation of the wings. But the allied species is far larger being 2.75 to 3.00 millimeters in wing length and the styles of the male hypopygium are distinctly swollen basally differing from the Japanese new species. The species name is related to the lace-texture-like appearance of the wing pattern.

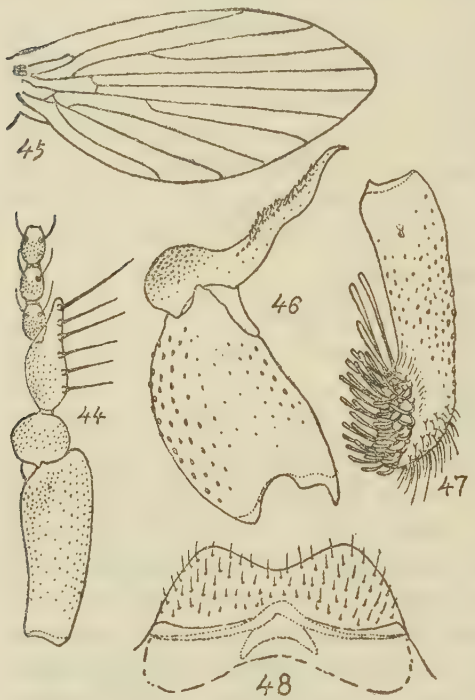
**PERICOMA DENTICULATISTYLETA Tokunaga et Etsuko, sp. nov.**

This is a rather large species and provided with wings showing a mottled appearance.

*Male.*—Body about 2 millimeters long. Front and vertex of head, thorax and abdomen with white hairs. Legs dark, but tibiæ and tarsal segments of all legs narrowly white at tips, but white rings of distal tarsal segments somewhat obscure; long bristles on basal half of tibiæ whitish gray, other bristles of legs dark brown. Wings brown, but with dark and white tufts of hairs on veins: dark tufts at forking points of $R_{2+3}$ and $M_{1+2}$ and on apical parts of main longitudinal veins; white tufts distributed as follows: eight arranged in a basal transversal band before two dark tufts at forking points of $R_{2+3}$ and $M_{1+2}$, one before dark marginal tuft on each vein of $R_2$, $R_3$, $R_4$, $M_1$ and $M_3$, and one on $M_2$ beyond basal dark tuft. Fringe of wing dark brown or brown, except for an apical whitish pale yellow fringe between tips of $R_3$ and $M_1$. Base of wing with whitish gray hairs.

Head somewhat cordiform, with eyes separated above as wide as two and haft facets. Antennæ (Fig. 44) dark brown on basal two segments, pale brown on flagellar segments, 16-segmented; first basal segment elongated slightly clavated, longer than twice of second; second subspherical; first flagellar segment elongated, somewhat spindle-shaped, produced distad beyond articulation to following segment and about thrice as long as second flagellar

segment, with six strong bristles arranged in a line; following flagellar segments cask-shaped; ultimate segment with a short apical projection; ascoids of antennal segments almost straight. Proportional lengths of basal and distal six segments about 52:15:31:10:10:10 and 9:9:8:7.5:7:9 respectively.




*Pericoma denticulatistyleta* Tokunaga et Etsuko, sp. nov.

FIG. 44. Basal six antennal segments of male.
45. Wing of female.
46. Coxite and style of male hypopygium.
47. Cercus of male hypopygium.
48. Subgenital lobe of female hypopygium.

Legs with TTR and TR about 2.28 and 2.0 in fore and 2.67 and 2.8 in hind leg. Wings 3.2 × 1.4 millimeters; membrane brownish hyaline and veins brown; tip of wing round. Venation: $R_{2+3}$ arose before origin of $R_5$, $R_{4+5}$ slightly longer than width of anterior basal cell (8:7), $R_{2+}$ slightly shorter than half of $R_2$ (37:80), RR about 0.46, forking point of $R_{2+3}$ opposite to that of $M_{1+2}$, origin of $M_2$ very narrowly obscure, $Cu_1$ ending far beyond level of two forking points, $R_5$ ending slightly beyond tip of wing, in one wing $M_2$ with a minute spurlike vein prolonged backwards at base.

Hypopygium (Figs. 46 and 47) large and black; cercus stout, almost straight, its apical part up-curved and not narrowed, with numerous retinacula; coxite large, as long as cercus and setigerous; style almost as long as coxite, semispherically swollen basally, setigerous on this swelling, its horny projection undulated, sharply pointed and with a minutely denticulated ridge along extensor side.

*Female.*—General structure and coloration similar to those of male. Relative lengths of basal and distal six antennal segments about 30:15:14:12:12:12 and 11:10:10:8:7.5:10 respectively; basal flagellar segments cask-shaped and distal segments suboval; ultimate segment with a rather distinct long papilliform apical projection. Legs with TTR and TR about 2.2 and 2.47 in fore and 2.41 and 2.44 in hind legs respectively. Wings (Fig. 45) $3 \times 1.3$ millimeters, generally as in male, but $R_{4+5}$ as long as width of anterior basal cell, RR about 0.48 (37:78), base of $M_2$ somewhat angulated and basal section before this angle obscure and in one wing with a minute backwardly prolonged spurlike vein. Subgenital plate (Fig. 48) with caudal lobe very short, shallowly and evenly incised at caudal margin and anterior base very broad.

*Locality.*—Hokkaido, Japan.

*Holotype.*—Male.

*Allotopotypes.*—Female.

*Paratopotypes.*—Males and females.

*Type specimens.*—Mounted in Gater's solution and dry; Ashoro, Tokachi, Hokkaido; June 16, 1954 (*Mr. M. Sasakawa*), deposited in the entomological laboratory, Saikyo University.

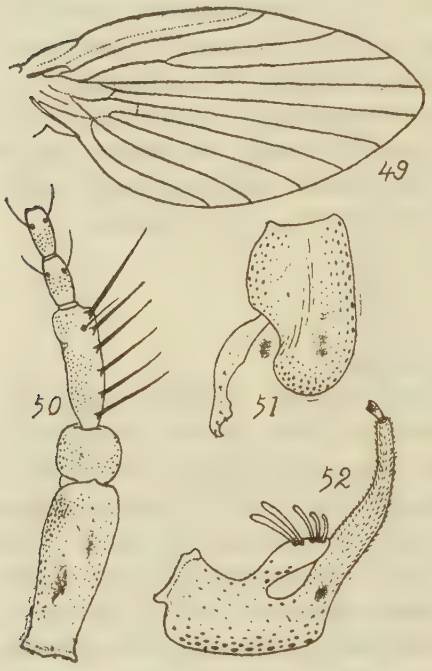
The present species is somewhat related to *P. neglecta* Eaton and *P. canescens* Meigen in the coloration of the body. But in the first allied species the male antennæ are simple, without strong bristles on the first flagellar segments and in the second species the male antennæ are provided with only three bristles on the first flagellar segments. The wing markings of the present new species are similar to those of *P. avicularia* Tonnoir, but the allied species is quite different from the new species in the structure of the male hypopygium. This species is named in the relation to the specific denticulated styles of the male hypopygium.

**PERICOMA FURCASTYLA Tokunaga et Etsuko, sp. nov.**

This species is rather large, provided with pale brown, white, and dark hairs on the wings and legs.

*Male.*—Body about 2 millimeters long. Front and vertex of head, thorax and abdomen covered with white hairs but integument shiny black. Legs mainly black, with scattered pale

brown scales showing frosted appearance; tibiæ pale brown at distal end and with long pale brown setæ. Wings pale brown and with many white hairs scattered on veins; base of wing with white hairs; fringe mainly dark brown but that on basal part of anterior margin white and that of apical part of wing yellowish white; dark tufts of hairs at distal parts of all longitudinal veins; white erect hairs scattered on basal two-thirds of wing and these hairs especially thick forming white patterns at forking point of $R_{2+3}$, on distal parts of $Cu_1$ and $M_3$ before marginal dark tufts, and on pre-apical area small white spots on veins $R_2$, $R_3$, $R_4$, and $R_5$ forming a large distinct white pattern.




*Pericoma furcastyla* Tokunaga et Etsuko, sp. nov.

FIG. 49. Wing of male.
50. Basal five antennal segments of male.
51. Coxite and style of male hypopygium.
52. Cercus of male hypopygium.

Head cordiform; eyes separated above as wide as about two and half or three facets. Maxillary palpi 4-segmented (25:45:45:60). Antennæ (Fig. 50) 15-segmented, basal two flagellar segments fused with each other forming a long cylindrical segment; first antennal segment elongated, somewhat clavate; second subspherical; third segment long, slightly constricted at apical one-third and provided with six strong bristles arranged in a line; other basal flagellar segments elongated fusiform, but distal segments oval; ultimate segment with a large papilliform terminal projection; relative lengths of basal and distal six segments about 55:19:34:11:11:11 and 11.5:10.5:10:9.5:8.5:15 respectively.

Hind legs with following proportional lengths except for coxæ and trochanters 44:52:24:10:6:5:6; their TTR and TR about 2.17 and 2.4 respectively. Wings (Fig. 49) $3.3 \times 1.6$

millimeters, broad and oval in shape, with tip round, brownish hyaline on membrane, brown on veins, with scales on basal one-third rather broader than hairlike scales on distal area. Venation: costal cell with a veinlike brown line along above $R_1$, $R_{2+3}$ arose before origin of $R_5$, $R_{4+5}$ subequal in length to width of anterior basal cell, $R_{2+3}$ shorter than half of $R_2$ (33:82), RR about 0.4, $R_4$ ending just before tip of wing, $M_2$ with a long basal backwardly elongated spurlike veins which is obscurely connected with the basal part of $M_3$ and true base of $M_2$ obscure and showing a cross-veinlike appearance, origin of $M_3$ just beyond base of $Cu_1$ but both bases obscure, forking point of $R_{2+3}$ beyond that of $M_{1+2}$ but far before tip of $Cu_1$ tip of $R_1$ above that of $M_4$.

Hypopygium (Figs. 51 and 52) large, characteristic in structure; coxite stout, projected caudad beyond insertion of style forming a round large process and entirely setigerous; style small, slender, sickle-shaped, not setigerous, with small tooth at tip and one or two accessory blunt small teeth on pre-apical part; cercus highly peculiar in shape being bifurcated into a short basal and a long slender apical lobe; common basal part of cercus thickened and setigerous, short basal lobe grown on common basal part, somewhat clavate and provided with four or five strong retinacula on apical part; long lobe distinctly directed dorsad, slightly undulated, without distinct setæ but pubescent and with an apical small but stout retinaculum.

*Female.*—Unknown.

*Locality.*—Hokkaido, Japan.

*Holotype.*—Male mounted in Gater's solution.

*Paratopotypes.*—Two males dry.

*Type specimens.*—Sibecha, Hokkaido; June 20, 1954 (*Mr. M. Sasakawa*); deposited in the entomological laboratory, Saikyo University.

This species is quite characteristic in the structures of the antennæ, the wing venation and the shape of the hypopygium, distinctly differing from known species of *Pericoma.* The species is named in the relation of the specific two forked cerci.

**PSYCHODA SETIGERA Tonnoir.**

The females of this species were reported from Shikoku in our previous paper and at present a male specimen was

collected by Miss I. Terashima from Mie-ken together with *Trichomyia itocoæ* Tokunaga et Etsuko, at light.

*Male.*—Body entirely brownish gray, about 1.1 millimeters long. Antennæ far setigerous than in female and with ascoids far larger. Wings about $1.9 \times 0.45$ millimeters, rather broad, oval, pointed at tip where $R_5$ is ended; bases of $R_3$ and $M_2$ atrophied and relative lengths of these two veins about 15:26. Hypopygium very closely similar to that reported by A. Tonnoir (1922).

*Specimen.*—A male mounted in Gater's solution; Aso, Mie-ken, Honshu; June 11, 1954 (*Miss I. Terashima,* at light); deposited in the entomological laboratory, Saikyo University.

# GONOPHORINI, BESONDERS VON DEN PHILIPPINEN *

Von Erich Uhmann
*Stollberg-Sachsen, Deutschland*

FÜNF TEXTFIGUREN

Diesem Beitrage liegt (wenn nichts anderes erwähnt) Material aus der Sammlung des Zoologischen Museums der Humboldt-Universität in Berlin zu Grunde. Diese Arbeit bildet den 11. Teil meiner Studien über die austral-asiatischen Hispinæ dieses Museums. Den grössten Teil des hier behandelten Materials stellt die Hispinen-Ausbeute von Georg Boettcher, die dieser ausgezeichnete Sammler von den Philippinen heimbrachte. Das Material findet sich speziell in coll. Moser. Ueber die Ausbeuten Boettchers und seines Förderers W. Schultze habe ich berichtet in meinem 26. Beitrage (N. Beitr. Syst, Ins. k. April, 1930; Mai, 1931; Juni, 1932 aus Z. Wiss. Ins. Biol.) and zu einem, zweiten Male in meinem 40. Beitrage [Fol. Zool. Hydrob. Riga 5 (1933)]. Dort schrieb ich auch über Gonophorini-Material anderer Wissenschaftler.

Von dem studierten Material wurden viele Belegstücke meiner Sammlung überlassen. Dafür danke ich auch noch an dieser Stelle.

## EINTEILUNG DER GONOPHORINI NACH DEM KLAUENGLIED NEBST KLAUEN

### 1. ABTEILUNG

1(16) Zwei Klauen vorhanden.

2( 9) Das Klauenglied überragt den Ausschnitt des vorletzten Fussgliedes, und die seitwärts stark heraustretenden Klauen liegen vor der Filzsohle dieses Gliedes.

3( 6) Halsschild-Ecken ohne Sinnesborsten. Die obere Kante des Mundes in der Mitte bogenförmig bis an die Fühlerwurzel vorgezogen, sodass dort für den Kopfschild kein Platz bleibt. Decken mit 10 Punktreihen, die 7. beginnt nicht an der Basis, sondern erst in oder hinter der Mitte.

* 167 Beitrag zur Kenntnis der Hispinæ (Coleoptera, Chrysomelidæ).

4( 5) Erstes Fühlerglied lang, im Umriss rechteckig in der Gestalt von den übrigen verschieden. Stirn mit dem Halse in einer Flucht gewölbt, neben jedem Auge grübchenartig vertieft.

*Pistosia* Ws.

5( 4) Erstes Fühlerglied wenig von den übrigen verschieden. Die Stirn bildet eine Querplatte, die an allen Seiten abfällt.

*Wallaceana* Maulik

6( 3) Halsschild-Ecken mit je einer Sinnesborste. Kopfschild entwickelt, bei *Wallacispa* aber sehr schmal.

7( 8) Rippe 1 und 2 mindestens an der Basis breit verflacht, die 3. Rippe nicht rückgebildet. Decken mit 8 Punktreihen.

*Downesia* Baly

8( 7) Rippen auch an der Basis scharf, die 3. in der Basalhälfte rückgebildet. Decken mit 8 Reihen, die 6. und 7. in der Mitte fehlend ..... *Wallacispa* Uh.

2. ABTEILUNG

9( 2) Das Klauenglied überragt die Filzschle des vorletzten Fussgliedes nicht. Die Klauen stehen seitlich nicht vom Klauenglied ab, sie sind rückwärts gerichtet, von oben nicht sichtbar (Fig. 1). Typisch bei *Gonophora*.

10(15) Decken mit 3 Rippen.

11(12) Decken von der Basis ab allmählich verbreitert oder gerundet heraustretend und nach hinten verengt, 3-reihig punktiert. Von den Rippen wenigstens die 3. durch einen grubenförmigen Eindruck unterbrochen ..... *Aspidispa* Baly

12(11) Decken an der Basis heraustretend, mit winkligen Schultern, mit 8 oft durch Zusatzreihen vermehrten Punktreihen.

13(14) Halsschild vor der Mitte am breitesten, von hier aus nach hinten allmählich, nach vorn plötzlich und in der Regel durch einen winkligen Ausschnitt verengt. Der Seitenrand fein, unregelmässig gekörnelt ..... *Gonophora* Chevrolat

14(13) Halsschild ziemlich zylindrisch, vorn vor der Mitte oft leicht verengt, die Kante des Seitenrandes fein, glattt, zuweilen an einigen Stellen erloschen ..... *Agonita* Strand

15(10) Decken mit 2 Rippen und 6 Punktreihen, an der Schulter der Rest der 3. Rippe und die Reste von 2 Punktreihen.

*Agoniella* Ws.

3. ABTEILUNG

16( 1) Nur eine Klaue ausgebildet.

17(18) Klaue schief gestellt, mit verdickter Basis. Klauenglied breit.

*Klitispa* Uh.

18(17) Klaue gerade, mit einfacher Basis. Klauenglied schlank.

*Monagonia* Uh.

DAS KLAUENGLIED NEBST KLAUEN BEI GONOPHORA CHEVROLAT (S. STR.)

Muster: *Gonophora xanthomela* Wiedem. (Fig. 1). Das Klauenglied nebst Klauen überragt das vorletzte Fussglied nicht, sein Vorderrand schneidet mit dem Vorderrand des letzteren ohne seine Filzsohle ab. Die schmalen, sichelförmigem Klauen treten nicht wie sonst üblich seitlich an der Spitze des Klauengliedes heraus, sondern liegen gewöhnlich zurückgeschlagen und damit innerhalb der Filzsohle des vorletzten Fussgliedes. Während sonst die Klauen in einer zur Achse des Klauengliedes mehr oder weniger *senkrechten* Ebene stehen, befinden sie sich hier in einer zur Achse nach innen geneigten Ebene. Man kann sie also bei senkrechter Betrachtung von oben nicht oder nur ganz wenig sehen. Bei einem Stück von G. *xanthomela* meiner Sammlung sind bei einem Tarsenglied die Klauen vorgestreckt und frei sichtbar. Das dürfte aber nicht die normale Stellung sein.

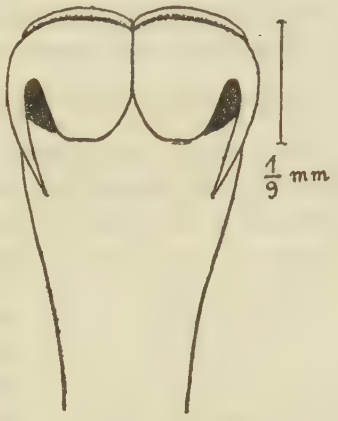


FIG. 1. Klauenglied von *Gonophora xanthomela.*

*Maulik* hat das Klauenglied für *G. pulchella* in Fauna Brit. India, Hispinæ (1919) 147, fig. 45 richtig dargestellt, dagegen ist das Klauenglied nebst Klauen in Weise, Genera Ins. 125, Hispinæ (1911) t. 4, fig. 9 bei *Aspidispa meijerei* Ws. und fig. 10 bei *Gonophora bengalensis* Ws. vom Zeichner unrichtig angegeben worden. Das Klauenglied muss viel kürzer, das vorletzte Fussglied nicht überragend, dargestellt werden. Es ist auch breiter. Die Klauen waren entweder gar nicht (*Aspidispa*) oder nur ganz wenig anzudeuten (*Gonophora*).

An der Basis ist jede Klaue stark erweitert. Es befindet sich dort ein grosser abgerundet-rechteckiger Basalanhang oder Zahn. Beide Zähne zusammen ergeben fast eine quer-rechteckige Fläche, die aber oben nicht an der Spitze des Klauengliedes ansitzt, sondern etwas nach innen gerückt ist, sodass das obere Ende dieses Gliedes wie ein schmales Dach die Basis beider Klauen überragt. Die Oberseite des Klauengliedes ist eben, unten ist es in der Längsmitte gewölbt. Diese gewölbte

Unterseite ist am verdickten Ende schräg nach vorn abgeschnitten und zeigt beiderseits eine Oeffnung (Fig. 1), die von der zugehörigen Klaue nebst Anhang verschlossen wird (in der Abbildung als schwarze Fläche dargestellt). Zu beobachten bleibt noch, ob die Klauen bein lebenden Tiere vorgestreckt und zurückgeschlagen werden können, oder ob die zurückgeschlagene Stellung dauernd innegehalten wird.

## ZUR RÜCKBILDUNG DER KLAUEN BEI KLITISPA UHMANN

Man kann von inneren und äusseren Klauen sprechen, so Maulik bei der Aufstellung der Gattung *Asamangulia,* Rec. Ind. Mus. (1915) 378 und dann Fauna Brit. India, Hispinæ (1919) 168. Für die Vorderfüsse ist diese Unterscheidung klar, weniger für die Mittel- und Hinterfüsse. Im Falle der Rückbildung einer Klaue ist eine andere Unterscheidung nötig. Ich winde deshalb die Bezeichnungen orad und caudad an, die wohl auch im Falle einer Rückbildung wie bei *Klitispa* verständlich bleibten. (Fig. 2.) Bei *Klitispa* ist die caudade Kralle mit ihrer grossen Basalerweiterung gut entwickelt, von der oraden ist ein kleiner Rest sichtbar. Die Klaue steht schräg an der Spitze des breiten Klauengliedes und besitzt sicherlich eine gewisse Beweglichkeit.

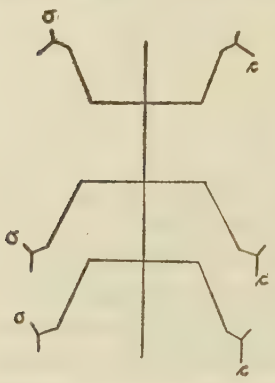


FIG. 2. Caudade und orade Klauen.

## ENTWICKLUNGSERSCHEINUNGEN BEI DEN GONOPHORINI

Das ordnende Prinzip unseres Geistes verlangt, dass wir alle Lebewesen nach ihrer Aehnlichkeit gruppieren und dadurch sie auch in verwandtschaftliche Beziehungen zueinander bringen. Wenn alle Gattungen, die wir in der Gruppe der Gonophorini (Weise's Kataloge 1911) zusammenfassen, wirklich hinein gehören, so muss es erlaubt sein, ihre Aehnlichkeiten als engere oder weitere Verwandtschaftsverhältnisse aufzufassen. Aehnlichkeit allein braucht ja noch keine Verwandtschaft zu bedingen, aber Konvergenzerscheinungen werden ja in unseren kleinen Gruppe wohl kaum zu erwarten sein. Ich glaube, dass es hier möglich ist, aus mehr oder weniger Aehnlichkeit direkt auf die entsprechende Verwandtschaft zu schliessen. Es soll

der Einfachheit halber "ähnlich" also auch "verwandt" gesetzt werden in dem Bewusstsein, dass dem nicht so zu sein braucht.

Zunächst kann man feststellen, dass die Gonophorini in ihrer 1. Abteilung durch *Pistosia, Wallaceana, Wallacispa* Beziehungen zur Gruppe der Anisoderini haben, und zwar zu *Lasiochila* Ws. durch den Bau der Mandibeln, den fast fehlenden Kopfschild und die bewimperte Oberlippe. Bei der Aufstellung von *Pistosia* hat schon Weise für diese Gattung auf die angeführten verwandtschaftlichen Verhältnisse im Bau des Mundes aufmerksam gemacht. Auch im Bau des Klauengliedes und der Anordnung der Klauen kann man hier Aehnlichkeiten feststellen. Weiter gehören *Pistosia* und *Wallaceana* näher zusammen durch das Fehlen von Porenpunkt und Sinnesborste in den Ecken des Halsschildes. Beide Gebilde haben sonst alle Gonophorini. *Downesia* gehört der Klauenbildung nach in die Verwandtschaft obiger Arten, hat aber einen gut ausgebildeten Kopfschild und geht in der Anordnung der Punktreihen und durch die Verflachung der Rippen sozusagen "eigene Wege." *Wallacispa* bildet in der Klauenbildung einen Uebergang zu den übrigen zweiklauigen Gonophorini. Der Basalanhang, der bei den bisher behandelten Gattungen nur in einer einfachen Verdickung des Klauengrundes bestand, hat sich bei *Wallacispa* stark vergrössert auf Kosten der Klauen, sodass der Anhang beinahe zum Hauptteil der Klaue geworden ist. Gleichzeitig hat sich das Klauenglied vorn verbreitert, sodass die immer noch seitwärts und fast senkrecht nach unten gerichteten Klauen von oben wenig sichtbar sind. In der Unterdrückung der 3. Rippe zeigt *Wallacispa* Beziehungen zu *Agoniella,* besonders durch die rudimentären Punktreihen 6 und 7 an der Schulter, während im Spitzenteil der Decken die 3. Rippe nebst den erwähnten Reihen gut ausgebildet ist. *Pistosia, Wallaceana, Wallacispa* und *Downesia* bilden die 1. Abteilung der Gonophorini.

In die 2. Abteilung stelle ich *Aspidispa, Gonophora, Agonita* und *Agoniella.* Von *Aspidispa* kenne ich nur ein Stück. Ich scheide deshalb diese Gattung von unseren Betrachtungen aus. Näher miteinander verwandt sind *Agonita* und *Gonophora* zunächst auf Grund der Klauenbildung, weiter haben beide Gattungen in der Bauart der Decken 3 vollständige Rippen, deren 4 Zwischenstreifen normal mit je einer Reihe von Doppelpunkten versehen sind zum Beispiel *Agonita clavareaui* Gest., *malangensis* Ws., *nitidicollis* Gest., *pallipes* Spaeth, Stylops 2 (1933)

273. Bei *A. indenticulata* Pic [Mél. exot. **41** (1924) 6] sind die äusseren beiden Doppelreihen in der Mitte zu einer verschmolzen, eine Erscheinung, die oft bei den Hispinæ auftritt und nicht als ein Merkmal verwandtschaftlicher Beziehung verwendet werden darf.

Viele *Agonita*- und *Gonophora*-Arten haben im vorn erweiterten 2. Zwischenstreifen einen oder auch zwei kurze Zusatzreihen (nach anderer Auffassung "Restreihen"), überhaupt kann man beobachten, wie bei *Agonita* eine Vermehrung der Punktreihen eintritt. So hat zum Beispiel *A. saundersii* Baly in allen Zwischenstreifen stellenweise 3 Reihen, bei *A. cherapunjiensis* Maulik [Fauna Brit. India, Hispinæ (1919) 131–, fig. 41] gibt es sogar Stellen mit 4 Reihen nebeneinander, bei *A. suturellamima* Maulik (loc. cit.: 134–, fig. 42 A) finden sich in der Spitzenhälfte des Randstreifens 2 Zusatzreihen ein. Bei *Gonophora femorata* Ws. ist hingegen eine Rückbildung der Zusatzreihe auf der Basis des 2. Zwischenstreifens erfolgt. Vielleicht kann man auch sagen, dass bei dieser Art die Zusatzreihe erst in der Ausbildung begriffen sei.

Von der gemeisamen Bauart der *Agonita*- und *Gonophora*-Arten weichen dann die *Agonita*-Arten ab, die im männlichen Geschlecht besondere Kennzeichen in der Verbreiterung der Vorderschienen tragen, zum Beispiel *A. spathoglottis* Uh. (14: 147), *undata* Uh. (14:149), *tayabasensis* Uh. (26 d:47–), *decorata* Gest. Diese "kräftigen Arten" zeigen überdies bei den beiden ersten Arten eine zunehmende Unregelmässigkeit in der Deckenskulptur, besonders bei *A. undata*. Man könnte die erwähnten Arten in eine Unterabteilung, aber nicht in eine benannte Untergattung, stellen.

Die Untergattung *Ekagonia* Maulik [Proc. Zool. Soc. London (1916) 571] gehört, wie ich in 100:120– dargelegt habe zu *Javeta* Baly, die verwandtschaftliche Beziehungen zu *Agonita* aufweist, sodass einige Arten von *Javeta* als *Agonita*-Arten beschrieben wurden (zum Beispiel *J. manicata* Gest., *flavida* Gest., *pachycera* Gest., *crassicornis* Gest., *kerremansi* Gest.). Wieweit die Verwandtschaft der Cœlænomenoderini mit den Gonophorini sonst noch zu verfolgen ist, soll an anderer Stelle untersucht werden.

Den Arten mit vermehrter Reihenbildung stehen die mit Reinhen- und Rippenrückbildung gegenüber, die in der nunmehr eigenen Gattung *Agoniella* zusammengefasst werden [Uhmann,

Parc nat. Upemba, Miss. de Witte **28** (1954) 21]. Näheres siehe weiter unten. Besonders sei hier hingewiesen auf die allmähliche Vergrösserung der Punkte spitzenwärts und damit schliesslich auf die Verschmelzung von Doppelpunkten zu nur einem als neu auftretende Skulpturabänderung. Bei einigen Arten von *Agonita* lässt sich das Beginnen feststellen, die 3. Rippe zum grössten Teile zu unterdrücken, besonders bei *A. atripennis* Pic und *nitida* Gest. Ueberhaupt zeigt die Bauart dieser Gattung die Erscheinung, Rückbildungen vorzunehmen. Durch Rückbildung einer Klaue entsteht *Klitispa* Uh., die mit *Agonita* noch das breite Tarsenglied gemeinsam hat. *Agoniella, Klitispa* und *Monagonia* kann man als "Abkömmlinge" von *Agonita* bezeichnen. *Klitispa* und *Monagonia* gehören in die 3. Abteilung der Gonophorini.

### DIE GABELUNG DER 2. RIPPE (Fig. 5)

Durch die Gabelung wird der Basalteil der 5. Reihe abgetrennt. Schon Weise spricht von dieser Gabelung und der dadurch bewirkten Umschliessung einer kleinen, tiefen Grube in der Beschreibung der *Agoni(t)a nigripennis,* jetzt *Klitispa* in Arch. Natg. **71** (1905) 100, vergleiche auch Spaeth in Stylops **2** (1933) 272 in der Beschreibung der *Agoni(t)a opacula* (jetzt *Klitispa*), wo der Autor auf die Inkonstanz dieser Gabelung bei dieser Art hinweist. Einfach bleibt die 2. Rippe bei *Aspidispa* und *Pistosia,* von denen mir allerdings nur je ein Stück vorliegt, auch bei *Wallaceana* (*W. biseriata* Uh. hat allerdings eine Andeutung eines Seitenästchens) und bei *Gonophora.* Ihre Untergattung *Micrispa* zeigt deutliche Gabelung. *Wallacispa* gabelt ebenfalls mehr oder weniger deutlich. *Downesia* verbreitert im Züge der Rippenverflachung mehrere Querwände, bis schliesslich der Basalteil der 5. und 6. Punktreihe verschwindet. Es ist also keine Gabelung vorhanden. *Agonita* gabelt nur schwach, dagegen ist die Gabelung bei *Agoniella* teilweise deutlich und bei *Klitispa* fast immer vorhanden.

Es fragt sich, ob diese Gabelung eine Weiterentwicklung bedeutet, also als erblich anzusehen ist, oder ob wir sie als strukturbedingt anzusehen haben. Das würde also heissen, dass sie mit der artlichen oder individuellen Ausbildung einer sich mehr oder weniger stark entwickelnder Schulter zusammenhängt.

## DIE BAUART DES HALSSCHILDE BEI AGONITA NEBST ABKÖMMLINGEN UND BEI GONOPHORA

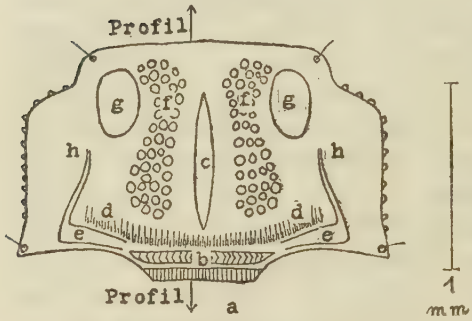



FIG. 3. Halsschild von *Gonophora mjöberji* Uh.

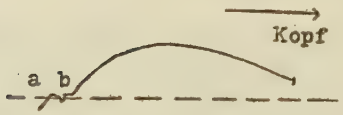



FIG. 4. Profil durch von Halsschild von Fig. 3.

Als typisch ist der Halsschild von *Gonophora mjöbergi* Uh. dargestellt (Figs. 3, 4). Die Bauart zeigt trotz der vielen artlichen Unterschiede zahlreiche gemeinsame Züge. So ist die Längsmitte durch eine beiderseits abgekürzte Mittelfurche betont (Fig. 3 c), vorm Schildchen liegt eine meist tiefe, schmale Querfurche (Fig. 3 b), der Halsschild-Vorderrand ist durch eine Querreihe von Punkten von der Scheibe abgesetzt: bei *Klitispa* und meist bei *Gonophora* und *Agonita*. Bei *A. spaethi* Uh. wird sie meist zu einem glatten Querstreifen umgebildet. Die Scheibe ist vorn kissenartig gewölbt (Fig. 4) und durch einen bogenförmigen Quereindruck vor der Querfurche (Fig. 3 d) vom Basalteil der Scheibe abgesetzt. Die Wölbung trägt beiderseits der Mitte 2 meist glatte Erhebungen (Fig. 3 g), die bei *Agonita* nebst Untergattung *Lachnispa* [Parc. nat. Upemba, Miss. de Witte 28 (1954) 21] meist kielförmig, bei *Gonophora* beulenförmig gestaltet sind. Sie werden durch mehr oder weniger deutliche Fältchen (Fig. 3 h) fortgesetzt, die mit je einer, zuweilen undeutlichen Basalerhabenheit (Fig. 3 e) in Verbindung stehen. Die Punktierung ist ganz verschieden, meist liegt sie zwischen der Mittelfurche c und den Beulen g. Ganz wenig skulptiert ist der Halsschild bei *Agonita* (*Micrispa*) *indenticulata* Pic, bei der nur die Basalskulpturen bemerkbar sind (nach einem Stück).

## GESCHLECHTSAUSZEICHNUNG VON GONOPHORA

Alle mir bekannten Arten, 22 von 62 haben im männlichen Geschlecht an der Spitze der Hinterschienen nach innen einen deutlichen, spitzen Zahn, bei vielen Arten tragen auch die Mit-

telschienen einen solchen. Zuweilen ist der Zahn der Mittelschienen kaum bemerkbar, bei seinem Fehlen ist die Spitze der Mittelschienen erweitert.

### DIE UNTERSEITE DER GONOPHORINI

In meinen Untersuchungen habe ich die Unterseite wenig beachtet. Weise hat in der Dtsch. ent. Z. (1897) 124– in Bezugnahme auf Chapuis, Gen. Coleoptera **11** (1875) 303 bei seiner Einziehung der Gattung *Distolaca* Baly auf die Bildung des Mesosternums aufmerksam gemacht: "Die *Gonophorites*, Chap. 303, . . . . und an den vertieften Mesosternum zu erkennen sind, von dem nur die hintere, aufstehende Kante sichtbar bleibt, während der vordere Teil vom Fortsatz des Prosternums bedeckt wird. . . ." Eine Ausnahme macht allerdings *Downesia* mit ihrem freien Mesosternum. In der Ausbildung der Vorderbrust zeigt *Downesia* auch eine Besonderheit. . . . Der Teil zwischen den Vorderhüften entwickelt sich hier zu einer hohen, flachen Platte (bei *D. javana* Ws. mit Mittelfurche), die meist nach dem Hals zu steil abfällt und deutlich die Anlage zu einer Kinnplatte zeigt (*D. javana*). Bei *D. bambusae* Maulik [Entomologist **66** (1933) 90–] ist die geschilderte Bildung der Vorderbrust weniger ausgeprägt.

### EINE NEUE GONOPHORA-ART VON DEN PHILIPPINEN

*Gonophora mindoroica* sp. nov. Elongata, nitida, flavo-testacea, mandibulis oculisque nigris, antennis ad apicem levissime infuscatis.—Fronte colloque levibus; prothorace transverso, antice convexo, impunctato, linea mediana tenuissima, antice abbreviata, disco postice foveis quattuor sparse punctatis, ante scutum linea transversa fortiter impressa; elytris tricostatis, costa tertia medio depressa, intervallis biseriatim punctatis, tranversim costulatis, intervallo tertio basi punctis nonnullis accessoriis.—5.5 mm.

*Gonophora mindoroica* sp. nov. steht der *G. femorata* Ws. (Philippinen) sehr nahe, aber Beine ganz gelbbraun und Fühler hell, zur Spitze geringfügig getrübt. Der Hauptunterschied liegt in der Skulptur der Scheibe des Halsschildes: Mittellinie nur sehr fein, beiderseits ohne Punkte, sodass beide Beulen vorn auf der Scheibe nach innen nicht abgegrenzt sind, der Vorderteil des Halsschildes ist daher durchlaufend gewölbt. Auch die Stücke, die ich für *G. angusta* Gest. halte, haben zwar wenig hervortretende Beulen, aber die Mittellinie und

einige Punkte beiderseits lassen doch keine *gemeinsame* Wölbung zustandekommen. Mit *G. linkei* Uh. von Malacca (23: 132) hat unsere Art die hellen Beine gemeinsam. Sie unterscheidet sich aber von ihr durch die hellen Fühler und die unpunktierte Wölbung des Halsschildes, vor allem aber durch die Geschlechtsauszeichnung des ♂, des bei *G. linkei* an jeder Schienenspitze zahnartig nach innen erweitert ist (neu!), während das ♂ von *G. mindoroica* nur an der Hinterschienenspitze einen Zahn hat. Unsere Art scheint hinsichtlich des Halsschildes auch der *G. nitidicollis* Gest. aus Sumatra ähnlich zu sein. Letztere unterscheidet sich aber nach der Beschreibung durch die Färbung der Fühler und Beine, ausserdem durch die Bildung der Rippen sofort von unserer Art.

Glänzend gelbbraun, Augen und Mandibeln schwarz, Fühler vom 6. Glied ab leicht angedunkelt.—Stirn glatt, zwischen den Fühlern sehr fein gekielt, oben mit kleiner, stumpfer Spitze, Kopfschild kaum gekielt.—Fühler länger als der halbe Körper, schlank, Glied 1 ellipsoidisch, 2 von gleicher Länge, zylindrisch, 3–5 untereinander fast gleich lang, 3 doppelt so lang wie 2, sehr fein punktiert, 6–10 pubeszent, einander fast gleich, 6 kürzer als 5, 1½ mal so lang wie 2, 11 um die Hälfte länger als 10.—Hals glatt. Halsschild etwas quer, Seiten hinten parallel, in der Mitte konvex, vorn stark eingeschnürt, krenuliert (in der Beschreibung von *G. bakeri* Uh. 26:52, lies statt "in der Mitte schwach ausgebuchtet" "in der Mitte schwach konvex"). Hinterwinkel rechtwinklig, mit Porenkegel. Scheibenmitte stark gewölbt, unpunktiert, Mittellinie nur angedeutet, hinten etwas mehr eingedrückt. Die bei *Gonophora* üblichen 2 Beulen nicht besonders ausgeprägt. Scheibe hinten mit einer breiten, gebogenen Querfurche bis zum Seitenrand, in der 4 einzeln punktierte Gruben liegen, jede äussere durch ein Fältchen von der inneren getrennt, vorm Schildchen eine schmale, tiefe Querfurche, sodass der Hinterrand emporgewölbt wird, beiderseits der Furche eine flache Beule. Schildchen und Decken wie bei *G. femorata.*

♂: Spitze der Hinterschienen innen mit einem spitzigen Zähnchen.

♀: Hinterschienen einfach.

6 ♂, 2 ♀, PHILIPPINEN: Mindoro, Calapan (Holotypus ♂, Februar 1, 1916, Allotypoid Februar 6, 1916, Mus. Berlin). 2 Paratypoide in coll. Uhmann.

SYNONYMIE

*Gonophora bakeri* UHMANN (26:51–) ist nach Typenvergleich identisch mit *G. femorata* Ws. [Philip. Jour. Sci. § D 8 (1913) 237–].

DIE AUSZEICHNUNGEN DER MÄNNCHEN BEI AGONITA

In den männlichen Auszeichnungen weicht *Agonita* insofern von *Gonophora* ab, als bei *Agonita* wieder eine Weiterentwicklung dieser Merkmale beobachtet werden kann, während sie bei *Gonophora* gleichmässig bleib en. Leider sind mir von der vielgestaltigen Gattung *Agonita* von den bis jetzt beschriebenen 70 Arten, ohne die Untergattung *Lachnispa,* nur 22, und diese oft nur in Einzelstücken, bekannt. Daher kann ich über die männlichen Auszeichnungen nur wenig sagen. In dem Schrifttum ist kaum etwas darüber zu finden. Es lassen sich immerhin 2 Haupttypen feststellen. Erster, weiter entwickelter Typ: Die Vorderschienen sind stark breitgedrückt, mit geschwungenen Rändern der Schmalseiten, die Mittelschienen sind an Basis und Spitze winklig erweitert. (Beim ♀ sind die Vorderschienen einfach und lassen zum Beispiel bei *A. undata* Uh. die Neigung zur Verbreiterung erkennen, die Mittelschienen haben auch die winkligen Erweiterungen, aber in geringerem Grade, und die Hinterschienen sind an der Spitze einfach). Hierher gehören die Arten, die ich oben als "kräftige Arten "bezeichnete. *A. mira* Gest. [Ann. Mus. Stor. natr. Genova (3) 47 7 (1917) 412–] hat auch erweiterte Vorderschienen, aber anscheinend rippenlose Decken. Zweiter, gonophora-ähnlicher Typ: (a) Mittel- und Hinterschienen ober (b) nur die letzteren haben am Ende einen kleinen Zahn. Beispiele für (a) *A. femorata* Ws., *pallipes* Spaeth, *chlorina* Maulik [Proc. Zool. Soc. London (1928) 157–, fig. 4] für (b) *tricolor* Chûjô. Die Fühler dieses 2. Typs sind beim ♂ länger als beim ♀, vor allem durch die spitzenwärts gelegenen Glieder. Diese sind schlanker, länger als breit. Dieser Unterschied ist manchmal sehr gering. Hier lässt sich ein Anklang an die ganz ähnlichen Merkmale wie bei *Agoniella* feststellen, auch die ganze Körperform erinnert bei den genannten Arten stark an diese Gattung.

*Agoniella podagrica* Gest. zeigt in der Verbreiterung der Vorderschienen des ♂ eine Parallele zur ähnlichen Erscheinung bei den "kräftigen Arten" von *Agonita,* aber diese Art verbreitert und zeichnet auch noch die Vorderschenkel besonders aus (siehe die Abbildung bei Gestro), beim ♀ sind die Vorderschienen auch verbreitert ohne sonstige Auszeichnung. Das ♂ von *Agoniella crassipes* Baly scheint ähnliche Merkmale zu haben.

DIE UNTERGATTUNGEN MICRISPA UND LACHNISPA

In die Untergattung *Micrispa* Gest. stellen wir *Gonophora*-Arten, die (1) einen herzförmigen Halsschild-Umriss haben, während die Grundskulptur der Scheibe gleichbleibt; (2) deren Deckenseiten mehr oder weniger Schwingung zeigen; (3) deren Rippen unterbrochen sind; (4) deren Beine kürzer und gedrungener sind und (5) an deren Fühlern man bei den hier aufgeführten Arten deutlich Schmal- und Breitseite unterscheiden kann und bei denen in beiden Geschlechtern ein Fühler-Dimorphismus festzustellen ist.—Die männlichen Auszeichnungen weisen *Micrispa* in die Verwandtsch aft von *Gonophora,* ebenso der geschlechtliche Unterschied an den Fühlern, Dieser ist bei *G. haemorrhoidalis* Weber und *integra* Baly noch unbedeutend, inkonstant, gewissermassen erst in der Entwicklung. Die anderen *Gonophora*-Arten lassen dort keinen Unterschied erkennen.

Die Untergattung *Lachnispa* Gest., halte ich für einen Abkömmling von *Agonita,* ausgezeichnet durch Vermehrung der Reihen, unregelmässige Rippen und Behaarung auf Halsschild und Decken. Ob die beiden bekannten *Lachnispa*-Arten in eine eigene Gattung gestellt werden müssen, soll erst nach Eingang grösseren Materials entschieden werden. Ich teile *Lachnispa* vorläufig als Subgenus der Gattung *Agonita* zu. Gestro stellte *Lachnispa* als Untergattung zu *Gonophora,* als von dieser *Agonita* noch nicht abgetrennt worden war. Mir liegen 2 Stück der Art *bicolor* aus meiner Sammlung vor, im Berliner Museum und damit in coll. Weise ist keine Art vertreten. Man darf daraus wohl annehemen, dass Weise keine der beiden Arten gekannt hat.

AGONIELLA Weise

*Agoniella* WEISE in Wytsman, Gen. Ins. Coleoptera 125 (1911) 85.

Die eigenartige Skulptur der Decken grenzt die Gattung gut von *Agonita* ab, sodass es berechtigt ist, die bisherige Untergattung als selbständige Gattung aufzustellen. Als Genotypus wähle ich *Agoniella manilensis* Ws. (Fig. 5).

Decken mit 2 Rippen, durch die 3 Zwischenstreifen entstehen. Die 1. Rippe verläuft schwach bogenförmig, indem sie anfängt sich hinterm Schildchen von den Naht zu entdernen, um kurz

vorm Deckenabfall sich ihr wieder zu nähern. Bei *A. vandepollii* Gest. ist der bogenförmige Verlauf sehr schwach ausgebildet). 2. Rippe gerade, erst auf dem Abfall nach der 1 Rippe verlaufend, zuvor biegt sie mehr oder weniger deutlich etwas aussen aus. Neben der Schulter mit der 1. Rippe durch ein kleine Rippenstück verbunden, sodass von der 5. Reihe mindestens ein Punkt abgetrennt wird, der dann meist in ein Grübchen zu liegen kommt. Die bei *Agonita* deutlich entwickelte 3. Rippe ist bei *Agoniella* unterdrückt, ein Ueberrest liegt auf der Schulter zwischen den beiden kurzen Restreihen 6 und 7. Beide Rippen vorn flach and zur Spitze an Höhe zunehmend, besonders die 1. Spitzenteil der Rippen oft durch die grossen Punkte angegriffen. und schwach geschlängelt. Decken mit 6 Punktreihen: 1.–5. und 8., in 3 Zwischenstreifen: Streifen 1, 2 und 3/4.

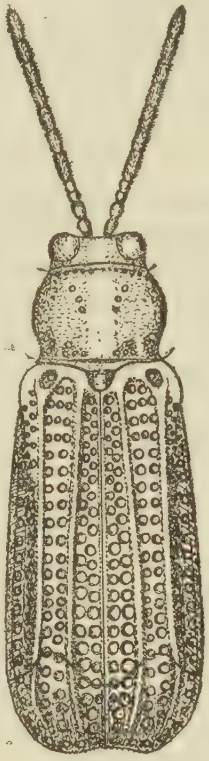


FIG. 5. *Agoniella manilensis* Ws.

1. Zwischenstreifen (einfach Streifen) in der Mitte am breitesten, mit 2 Punktreihen, deren Punkte bis zur Spitze grösser werden. Bei einigen Arten (*A. manilensis* Ws. und *banksi* Ws.) werden sie sogar grübchenförmig, sodass schleisslich nur noch eine Reihe, die zweite, auf dem Abfall vorhanden ist.

2. Streifen an der Basis verbreitert, dann verschmälert, an der Spitze wieder etwas breiter, mit 2 Punktreihen, zwischen denen an der Basis einige Zusatzpunkte oder eine kurze Zusatzreihe liegen, bei *A. horsfieldi* Baly können sie manchmal fehlen. Die Punkte der normalen Reihen nach hinten mehr oder weniger vergrössert, bei *A. vandepollii* Gest. und *strandi* sp. nov. fast normal.

3./4. Streifen mit 2 Punktreihen, zwischen denen auf der Schulterbeule 2 kurze Reihen liegen, die den sonst unterdrückten Reihen 6 und 7 zugeordnet werden müssen und die den Rest

der 3. Rippe einschliessen. Eine von mir nicht beschriebene neue Art hat auf diesem vereinigten Streifen an dem hinteren Aussenwinkel noch eine Rest-(oder Zusatz?) Reihe zwischen beiden Reihen.

Die Krenulierung der Deckenspitze und deren Ausrandung vor der Nahtecke unterliegt individuellen Schwankungen, sodass beide Merkmale zur Artabgrenzung nicht brauchbar sind.

### AGONIELLA-ARTEN DEN PHILIPPINEN

Besonders zahlreiche Arten kennen wir von den Philippinen. Hier scheint ein Zentrum ihrer Verbreitung zu liegen. Gestro hat 4 Arten von dort beschrieben. Georg Boettcher fand dort ein arten reiches Material. Die Zuordnung der Stücke zu den einzelnen Arten betrachte ich in meiner Arbeit als provisorisch. So könnten in mancher Art auch mehrere enthalten sein. Es scheint ein regionales Variabilitätsvermögen sowohl in individueller als auch in artlicher Hinsicht dieser Gattung innezuwohnen, das sich bis zur Artbildung steigern kann.

Gestro hat leider in Ann. Mus. Stor. natr. Genova (3) 47 7 (1917) 414–418 Arten nach Einzelstücken beschrieben, wie *A. pygmaea, rotundicollis; longula* und früher *vandepollii* nach zwei Stück. So lange die Typen einem Bearbeiter nicht vorgelegen haben, kann kein sichsres Urteil über das Material gefällt werden. 52 Stück des berliner Materials, unter denen sich sicher mehrere neue Arten befinden, blieben unbestimmt.

Wenn nichts anderes erwähnt, befindet sich das Material im Museum Berlin.

(1) *Agoniella manilensis* Ws. 1 ♂, Paratypoid (Manila, W. Schultze leg.). Ein weiteres Stück (C. S. Banks leg.) dürfte aus derselben Bestimmungssendung stammen wie der Typus. Da es aber 5 mm gross ist, und Weise in seiner Beschreibung nur 4–4.3 mm angibt, kann es nicht als Paratypoid bezeichnet werden. Weise hat seine *Agoniella*-Arten zu kurz beschrieben. Er kannte den Reichtum an ähnlichen Arten dieser Gattung noch nicht. Ich gebe daher eine Ergänzung seiner Beschreibung nach dem Paratypoid.

Sehr wichtig ist die Bildung der Fühler: Knapp halb so lang wie der Körper (♂), Glieder 1–4 auffällig kurz, 1 und 2 ellipsoidisch, wenig länger als breit, 4 fast gleich 3 (an diesen kurzen Gliedern ist die Art leicht kenntlich), 5 dicker, schwach konisch, so lang wie 3–4, 6 und folgende zylindrisch, dicker als die Basalglieder, einander fast gleich, jedes kürzer als 5,

11 kurz zugespitzt.—Halsschild breit, siehe Weise.—Wichtig ist der Verlauf der Punktreihen und die Grösse der Punkte auf den Decken. 1. Zwischenstreifen mit 2 Reihen, von denen die 1. kleinere Punkte hat. 2. Streifen an der Basis mit einer kurzen Zusatzreihe, die Hauptreihen einander gleich, die Punkte nach der Spitze zu grösser, am Ende des Streifens ein grösser Punkt. 3./4. Streifen auf der Schulter mit den 2 kurzen Restreihen 6 und 7, die beiden normalen Reihen mit gleichen Punkten, die zur Spitze grösser werden.—Deckenspitzenrand krenuliert, vor der Nahtecke kaum ausgerandet.

Diesem Paratypoid gleichen noch 1 Stück: Masbate: Aroroy und 1, Panaon. Ein zweites Stück von Panaon gleicht dem oben erwähnten von Banks gesammelten in der Grösse und der entsprechend stärkeren Skulptur auf den Decken. Weiter liegen noch Stücke vor von Luzon: Bangui (10 St.), Arite (1), Mt. Isarog (1) und Mt. Bulusan (1); Catanduanes Ins. (1) mit grösserem, schwarzem Decken-Spitzenfleck. Alle Stücke des erwähnten Materiales sind Männchen (coll. Moser; G. Boettcher leg.).

Allotypoid, ♀: LUZON: Manila, Februar 26, 1914 (G. Boettcher S., coll. Moser). Andere ♀♀: 1, LUZON: Mt. Bulusan; 1, Imugan; 1, Panaon; 1, SAMAR: Catbalogan (G. Boettcher leg., coll. Moser). Beim Allotypoid sind Fühler deutlich kürzer als der halbe Körper, Glied 1–4, besonders das 4. durch ihre Kürze auffallend, allerdings nicht so stark wie beim ♂, da die Glieder 5–11 kürzer als beim ♂ sind. Glied 5 nicht so lang wie 3 + 4. Glied 1 und 2 ellipsoidisch, wenig länger als breit, 3 konisch, fast so lang wie 2, 4 so lang wie 3, zylindrisch, 5 nicht so lang wie 3 + 4, fast zylindrisch, 6–10 einander fast gleich, 6 und 7 wenig länger als breit, 8 quer, 9 und 10 fast quadratisch.—Die anderen 4 ♀ mit einigen belanlosen, individuellen Abweichungen einzelner Glieder.

(2) *Agoniella banksi* Ws. 1 Paratypoid, ♂: Manila (coll. Schultze, C. S. Banks leg.) 106064. Nach dem Katalog von Schultze (1915) 104 stammt das Material dieser Art von LUZON: Rizal, Montalban Gorge. Die Art ist an der Verteilung der schwarzen Färbung auf den Decken leicht kenntlich: der schwarze Spitzenfleck erweitert sich an Naht und Seitenrand nach vorn. Fühler des Paratypoides fast gleich stark, halb so lang wie der Körper, die ersten 4 Glieder in der Länge fast gleich, jedes um die Hälfte länger als breit, 5. Glied länger als das 4., doppelt so lang wie breit, von den folgenden ein jedes so lang wie das 5.

Decken des Paratypoides. 1. Zwischenstreifen mit 2 Punktreihen, deren Punkte zur Spitze immer grösser werden und zwar bei Reihe 2 stärker, bis beide sich an der Spitze zu einer vereinigen. Diese besteht dann links aus 3, rechts aus 4 grossen Gruben.—2. Streifen mit 2 Reihen, zwischen denen an der Basis eine kurze Zusatzreihe liegt. Die Punkte der 2 Reihen werden zur Spitze immer grösser, bis beide auf dem Abfall sich in *einen* grossen Punkt vereinigen.—3./4. Zwischenstreifen mit 2 Reihen, welche die beiden üblichen kurzen Restreihen auf der Schulter einschliessen. An der Spitze werden die Punkte etwas grösser. Am Spitzenrand nur noch eine Reihe, die sich bis zur Nahtecke hinzieht.—Hinterrand der Decken nur ganz undeutlich krenuliert, vorm Nahtwinkel ausgerandet. Tarsen etwas angedunkelt, die Färbung der Decken hat Weise genügend beschrieben. Soweit die ergänzende Beschreibung des Paratypoides.—Der Deckenhinterrand ist bei manchen Stücken fast glatt, die Ausrandung fast immer deutlich.

♀. Allotypoid, LUZON: Los Baños, Februar 27, 1914 (G. Boettcher leg., coll. Moser). Fühler kürzer als der halbe Körper, die ersten Glieder wie beim ♂, 6. kürzer als das 5., die folgenden nehmen etwas an Länge ab, 9. und 10. so lang wie breit, fast quer. Anderes Material: LUZON: Los Baños (6 ♂, 4 ♀), Mt. Bulusan (3 ♂, 3 ♀), Paete (1 ♂, 1 ♀). MINDANAO: Surigao (4 ♂). Polillo (1 ♂).

Was ich von LUZON: Mt. Makiling (Baker leg.) bisher (40:68) zu *Agoniella pygmaea* Gest. stellte, ist *A. banksi.* Vielleicht sind beide Arten identisch. Was ich 28 d:50 und 40:68 als *A. banksi* aus Palawan gemeldet habe, ist eine neue Art, die ich weiter unten als *A. strandi* beschreibe. Sie stimmt in der Färbung ganz mit *A. banksi* überein, unterscheidet sich aber in der Punktierung der Decken von ihr.

2a. *Agoniella banksi* Ws. chromatio. 1 ♀, MINDANAO: Surigao. Dieses Stück ist durch Rückbildung der schwarzen Färbung auf den Decken bemerkenswert. Schwarz sind Seitenrand und Naht von der Basis bis zur Spitze, aber die schwarze Spitzenfärbung ist bis auf einen schmalen Spitzensaum rückgebildet.

(3) *Agoniella biformis* Uh. PHILIPPINEN: Mindanao, Dansalan (23 ♂, 17 ♀, G. Boettcher leg., coll. Moser). 17 St. haben den grossen, schwarzen Fleck auf der Deckenspitze, die übrigen einfarbig gelbbraun.—1. Streifen mit 2 Punktreihen, deren Punkte zur Spitze nur mässig grösser werden, bei Reihe

2 etwas grössere Punkte, auf dem Deckenabfall kurz vorm Ende der 1. Rippe nur eine Reihe da.—2. Streifen mit 2 Punktreihen, zwischen denen vorn eine Zusatzreihe bis zu einem Fünftel der Decken liegt. Die Punkte werden auch zur Spitze mässig grösser, bis beide Reihen auf dem Abfall sich in *einen* grossen Punkt vereinigen. 3./4. Streifen mit Punktreihen wie bei *A. banksi,* aber am Spitzenrande 2 Reihen.—Decken-Spitzenrand mehr oder weniger deutlich krenuliert, an der Nahtecke nur schwach oder kaum ausgerandet, Epipleuren an dieser Stelle nach unten mehr oder weniger vorgezogen.

In der Fühlerbildung ähnelt *A. biformis* der *A. manilensis,* das heisst, die 4 Basalglieder fallen durch ihre Kürze auf, aber sie sind doch nicht so kurz wie bei letzterer, bei der die Glieder 3 und 4 kaum länger als breit sind. Bei *A. biformis* sind sie dagegen deutlich länger als breit., Glied 5 kürzer als 3 + 4, 6 kürzer als 5, die übrigen Glieder wie bei *A. manilensis.*

♂ : Fühler so lang wie der halbe Körper. ♀ : Fühler kürzer als der halbe Körper, Glied 6 und folgende kürzer als die entsprechenden des ♂.

Bei zweifelhaften Stücken lässt sich wohl auch die Färbung zur Trennung beider Arten heranziehen. Einfarbige Stücke gehören zu *A. biformis,* ebenso solche mit schwarzer Deckenspitze, bei denen aber der Spitzenrand gelbbraun bleibt. Stücke mit mehr oder weniger schwarzer Deckenspitze, bei denen die schwarze Färbung auch den Deckenrand bedeckt und zuweilen auch die halbe Decke einnimmt, sind *A. manilensis.*

(4) *Agoniella longula* Gest. 36 ♂, 16 ♀. LUZON: Balbalan; Cabugan; Prov. Apayao; Mt. Data; Tinglagan; Imugan. MINDORO: Subaan. Von Gestro's Beschreibung seiner 2 Stück [Ann. Mus. Stor. Natr. Genova (3) 47 7 (1917) 415–] weicht das Material in folgenden, wohl unwesentlichen Punkten ab: (1) Auf der Unterseite ist nicht nur die Vorderbrust, sondern auch die Hinterbrust und zuweilen auch die Basis des Bauches gelbbraun; (2) auf dem Kopf ist "die feine Querlinie mit einigen feinen Punkten" nicht festzustellen. Das eine von Baker gesammelte Stück aus LUZON: Baguio, Benguet, Nr. 6101 (Paratypoid) habe ich gesehen (40:68).

1. Zwischenstreifen mit 2 Punktreihen, deren Punkte nach hinten allmählich grösser werden, besonders die der 2. Reihe. Erst auf dem Deckenabfall verschmelzen die Punkte zu einer Reihe. Auch auf dem 2. Zwischenstreifen 2 Punktreihen, deren

Punkte nach hinten allmählich grösser werden, an der Basis einige Zusatzpunkte zwischen der 3. und 4. Reihe. 3./4. Streifen mit 2 Punktreihen, die an der Schulter wie üblich 2 kurze Restreihen einschliessen. Die Punkte werden ebenfalls zur Spitze grösser. Die Punkte der 5. Reihe sind grösser als die der 4. Reihe. Decken am Spitzenrand krenuliert, an der Nahtecke mehr oder weniger ausgerandet.—Fühler beim ♂ von halber Körperlänge, Glied 1–4 einzeln kürzer als jedes der folgenden Glieder. Unterschied aber nicht bedeutend. Fühler beim ♀ kürzer als der halbe Körper, jedes Glied etwas kürzer als das entsprechende beim ♂.

4a. *Agoniella longula* Gest. chromatio. Von Nord-LUZON: Mt. Polis liegen mir noch 6 ♂ und 2 ♀ vor, bei denen der Halsschild ganz und die Basis der Decken in geringem Umfange gelbbraun sind. Das ist sicher eine nicht ausgefärbte schwarze Chromation. Ganz schwarze Oberseite haben 10 ♂ und 7 ♀ ebendaher. Unter ihnen sind einige, die noch nicht ganz ausgefärbt sind. Ferner noch 2 ♂ und 1 ♀ aus Nord-LUZON: Bontoc und 1 ♂ aus Imugan, 1 ♂ MINDANAO: Surigao. Das gesamte Material in coll. Moser, G. Boettcher leg. Februar und März, 1917.

(5) *Agoniella pygmæa* Gest. Von den 3 Stück von LUZON: Mt. Makiling (Baker leg.), die ich in 40:68 erwähnte, steckt eins in meiner Sammlung. Es gehört zu *A. banksi* Ws., deren Typus mir seinerzeit unbekannt war; sicher gehören die beiden anderen Stücke auch zu *A. banksi*. Eins von diesen 3 Stücken erwähnt auch Gestro am Ende seiner Beschreibung der *A. pygmæa*. Ich vermute, dass letztere Art mit *A. banksi* identisch ist.

(6) *Agoniella rotundicollis* Gest. [Ann. Mus. Stor. Natr. Genova (3) 47 7 (1917) 417]. Beschrieben nach einem Stück von LUZON: Mt. Makiling (Baker leg.). Was ich 40:68 als diese Art bestimmt habe gehört einer anderen Art an. Bei *A. rotundicollis* sollen die beiden Basalglieder der Fühler dicker sein als die übrigen, und der Halsschild soll stark gerundete Seiten haben. Alle anderen Angaben passen auch auf andere Arten.

(7) *Agoniella schultzei* Uh. (26d:49–). PHILIPPINEN: 1, Panaon; LUZON: Prov. Apayao (7), Bangui; Los Baños (7), Zambales (2); MINDANAO: Momungan (1), Surigao (2); MINDORO: Subaan (1); MASBATE: Aroroy (1). (G. Boettcher leg., coll. Moser.)

Der *A. manilensis* Ws. ähnlich, unterscheidet sich sofort durch den Fühlerbau. Die Glieder 1–4 zeichnen sich nicht durch ihre Kürze aus, sondern sie unterscheiden sich in ihrer Länge wenig oder kaum von den übrigen. Die Fühler sind fast gleich denen der *A. banksi.* Ws.—1. Zwischenstreifen mit 2 Punktreihen, deren Punkte zur Spitze immer grösser werden und zwar bei Reihe 2 stärker, bis beide Reihen an der Spitze sich zu einer vereinigen wie bei *A. banksi,* bei letzterer sind aber die Punkte der vereinigten Reihe grösser.—2. Streifen mit 2 Reihen wie bei *A. banksi,* aber die Zusatzreihe an der Basis nur durch wenige Punkte angedeutet oder auch nicht vorhanden.—3./4. Streifen mit 2 Punktreihen, welche die beiden üblichen kurzen Restreihen auf der Schulter einschliessen, an der Spitze werden die Punkte etwas grösser, am Spitzenrand nur noch eine Reihe, die sich bis zur Nahtecke hinzieht.— Deckenhinterrand fein krenuliert, an der Spitze nicht ausgerandet.

♂ : Fühler länger als beim Weibchen. Trotz individueller Schwankungen sind die Glieder vom 5. ab untereinander fast gleich lang, der ganze Fühler etwa halb so land wie der Körper.

♀ : 6. Glied etwas kürzer als das 5., ebenso von den folgenden Gliedern jedes etwas kürzer als 5 oder 6, dadurch werden die Fühler im ganzen kürzer und sind nicht halb so lang wie der Körper.

(8) *Agoniella strandi* sp. nov. PHILIPPINEN: Nord-Palawan: Binaluan. November, Dezember, 1913 (2 ♂, 3 ♀), coll. Uhmann (G. Boettcher leg.), ebenso 1 ♂, Nord-Palawan: Iwahig (W. Schultze leg), 1 ♂, Nord-Luzon: Cabugo (G. Boettcher leg.).— 3.5–4.5 mm. *A. strandi* gleicht der *A. banksi* Ws. in der Färbung. Sie wurde von mir bisher für letztere gehalten (40:68). Ob die Stücke in 26:50 die echte *A. banksi* sind, kann ich jetzt nicht sagen. Die neue Art scheint auch in der Abänderung der Zeichnung auf den Decken und am Bauche dieselbe Variabilitätsbreite wie *A. banksi* zu haben. Hauptunterschiede: *A. strandi* hat in der Zwischenstreifen normale Punktreihen. 1. Streifen mit 2 regelmässigen Punktreihen, deren Punkte nach der Spitze zu nur wenig grösser werden. Eine Vereinigung der Reihen tritt erst auf dem Deckenabfall in wenig auffallender Weise ein, da der Streifen hier wie an der Basis verschmälert ist.—2. Streifen mit 2 gleichen Punktreihen, an der Basis mit kürzer eingeschlossener Zusatzreihe. Punkte zur

Spitze etwas grösser.—3./4. Streifen mit zwei gleichen Punktreihen, die an der Schulter zwei kurze Restreihen einschliessen. Deckenspitze sehr schwach krenuliert, ohne Ausbuchtung vor der Nahtecke. Die 5 eben behandelten Paratypoide stimmen in beiden Merkmalen fast mit dem Holotypus überein.

*Holotypus.*—Halsschild schwach quer, vorn mit eingedrückter Querreihe von kleinen Punkten, hinten mit 4 flachen, zerstreut punktierten Grübchen, auf der Scheibe beiderseits mit einer schrägen Punktreihe, sodass eine V-förmige Skulptur entsteht, ausserhalb dieser die Scheibe mit schwacher Beule. Seitenrand S-förmig geschwungen.

♂ : Fühler so lang wie der halbe Körper, Glied 1 und 2 ellipsoidisch, 3 und 4 schwach konisch, Glied 2–4 etwas länger als breit, 1 etwa so lang wie breit, von Glied 5 ab die Fühler etwas stärker, pubeszent, 5 länger als 4, konish, die übrigen fast zylindrisch, untereinander fast gleich lang, jedes ein wenig kürzer als 5, aber deutlich länger als breit. Endglied mit aufgesetzter Spitze.

*Allotypoid.*—Fühler kürzer als der halbe Körper, Glied 5–11 kürzer als beim ♂, jedes nur wenig länger als breit.

Diese beiden Typen von Nord-Palawan: Binaluan.

Im Berliner Museum stecken folgende Paratypoide: 1 ♂, 1 ♀, Nord-Palawan: Panoe; 3 ♂, 11 ♀, Binaluan.

(9) *Agoniella vandepollii* Gest. 1, Palawan (Staudinger), coll. Weise. Stimmt gut zur Beschreibung, was aber nicht viel besagen will. Gestro vergleicht die Art mit seiner *A. munda* und *tersa*. Er trennt sie von beiden zunächst auf Grund der Färbung und dann wegen der Deckenskulptur. Leider sagt er nichts über die Fühler. Wichtig scheint mit seine Bemerkung: "La prima costa degli elitri è più regolarmente parallela alla sutura . . ." Ich füge hinzu: im mittleren Drittel, denn an der Decken-Basis und Spitze läuft die 1. Rippe konvergent zur Naht. Bei dem von Weise als *A. vandepollii* angesprochenen Stück sind die Fühlerglieder 1–7 länger als breit, 8–10 schwach quer, vor allem unterscheidet sich das 3. durch seine Länge und schlanken konischen Bau von den Nachbargliedern, 1 und 2 sind ellipsoidisch und die anderen ziemlich zylindrisch. Rippen an der Spitze allmählich verflacht, nicht stärker erhaben wie bei den anderen Arten.

*Schlüssel der Agoniella-Arten von den Philippinen*

Das ♂ hat längere Fühler als das ♀, vom 5. Glied ab sind sie dichter behaart, dieses zeichnet sich durch seine Länge aus. Es ist grösser als die Nachbarglieder, oft überhaupt das grösste.

Die Verteilung der Farben schwankt oft, und die Färbung kann nur in einigen Fällen als Unterscheidungsmerkmal herangezogen werden.

1( 4) Fühlerglied 1–4 untercheidet sich durch die geringe Länge auffällig von den anderen Gliedern.

2( 3) Gieder 1–4 auffällig kurz, vor allem 3 und 4, besonders beim ♂, 4. Glied so lang wie breit, beim ♂ Glied 5 mindestens doppelt so lang wie 4, beim ♀ Glied 5 kürzer, aber immer noch das längste, 7–10 zylindrisch, länger als breit (♂) oder schwach quer (♀). Punktreihen, besonders die des 1. und 2. Zwischenstreifens zur Spitze mit grösseren Punkten oder Grübchen. Auf dem 1. Zwischenstreifen vereinigen sich die beiden Reihen erst auf dem Abfall (Fig. 5).

*Manila,* Luzon; Catanduanes Ins., Panaon; Samar; Masbate ..... *manilensis* Weise

3( 2) Glieder 1–4 kurz, besonders beim ♂, Glied 3 und 4 aber länger als breit, auch beim ♂ kaum kürzer als eins der beiden Basalglieder. Unterschied zwischen 4. und 5. Glied nicht so stark wie bei *A. manilensis.* Punkte und Reihen wie bei dieser.

*Mindanao;* Negros; Samar ..... *biformis* Uhmann

4( 1) Glieder 1–4 länger als breit. Sie unterscheiden sich in der Länge nur wenig von den übrigen.

5( 8) Punkte der Reihen nach der Spitze zu stark vergrössert, besonders die Punkte der 2. Reihe auf dem 1. Streifen.

6( 7) Deckenspitze schwarz, an Naht und Seitenrand das Schwarz nach vorn vorgezogen. Reihe 1 und 2 vor dem Abfall zu Grübchen verschmolzen.

*Manila,* Luzon; Mindanao; Polillo; Benguet.... *banksi* Weise

7( 6) Die schwarze Färbung nicht so vorgezogen, ihr Vorderrand konvex, Decken auf dem Abfall oder auf mehr oder weniger grossen Teil der Hinterhälfte schwarz. Reihe 1 und 2 erst auf dem Abfall zu Grübchen verchmolzen.

*Luzon;* Panaon; Mindanao; Mindoro; Masbate.
*schultzei* Uhmann

8( 5) Punkte der Reihen zur Spitze wenig vergrössert.

9(10) 1. Rippe im Mitteldrittel der Naht parallel, auf dem Abfall nicht stark erhaben (Profil). Reihen fast gleichmässig punktiert, Reihe 1 und 2 bis auf den Abfall getrennt. Gelbbraun, Deckenspitze schwarz. Nach 1 Stück dieses Materials.

*Palawan;* Luzon; Mindanao ..... *vandepollii* Gestro

10( 9) 7. Rippe im Mitteldrittel bogenförmig, auf dem Abfall stark erhaben (Profil). Punktreihen nach der Spitze zu mit grösseren Punkten.

11(12) Vorderhälfte der Körperoberseite gelbbraun, Hinterhälfte schwarz, oder Oberseite zunehmend schwarz bis ganz schwarz.

*Benguet,* Luzon; Mindoro; Mindanao; Panay.
*longula* Gestro

12(11) Oberseite gefärbt wie bei *A. banksi.*

*Palawan;* Luzon ..... *strandi* sp. nov.

Im Schlüssel fehlen *A. pygmæa* Gest., und *rotundicollis* Gest., ebenso *apicalis* Baly. Diese wurde von Celebes beschrieben, später durch Chapuis von Luzon und durch Gestro von Mindanao gemeldet. Ich sah aber bisher kein Stück, das mit Sicherheit zu dieser Art gestellt werden könnte.

MEINE HIER ERWÄHNTEN BEITRÄGE

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# ABBILDUNGEN

## TEXTFIGUREN

FIG. 1. Unterseite des linken Klauengliedes der Vorderbeine von *Gonophora xanthomela* Wiedemann. Java: Preangar, G. Tjisoeroe (E. Walsh leg.).
Zwischen beiden Klauen und ihrem Anhang ist ein Hohlraum sichtbar (in der Figur schwarz).
Der überragende Vorderrand des Klauengliedes ist durch eine punktierte Linie abgesetzt.

2. Schematische Darstellung der Lage der caudaden(c) und oraden(o) Klauen.

3. Schematische Darstellung des Halsschildes von *Gonophora mjöbergi* Uhmann. Ost-Borneo: Pajau River (*Mjöberg* leg.). Die Erklärung der Buchstaben siehe im Text.

4. Profil des Halsschildes durch die linke Seite (siehe Fig. 3).

5. *Agoniella manilensis* Weise, ♂. PHILIPPINEN: Luzon, Bangui (G. Boettcher leg.). Benennungen der Deckenskulptur.
Zwischen Naht und 1 Rippe: 1. Zwischenraum mit den Reihen 1 und 2.
Zwischen 1. und 2. Rippe: 2. Zwischenraum mit den Reihen 3 und 4 und der Zusatzreihe an der Basis.
Zwischen 2. Rippe und dem Seitenrand: 3./4. Zwischenraum mit den Reihen 5 und 8 und den Restreihen 6 und 7 beiderseits der Schulter-Restrippe. Nur die 6. Reihe ist sichtbar: 5 kleine, schwarze Punkte. Beachte die deutliche Gabelung der 2. Rippe an der Basis und das abgetrennte Basalgrübchen mit 2 Punkten der 5. Reihe.
Die Linie vor der Spitze der Decken gibt die vordere Grenze des schwarzen Spitzenfleckes der Decken an.

# SHIGELLOSIS I. AN ANALYSIS OF 445 CASES OF SHIGELLOSIS *

By A. P. DE RODA, F. SABILLO, and G. D. ARCAYNA
*Division of Public Health Laboratory, Manila Health Department*

ONE TEXT FIGURE

For a period of 18 months (June, 1951 to December, 1952), the authors studied 445 San Lazaro Hospital case-patients from whom *Shigella* organisms were isolated. The purpose of this paper is to report on their studies made on the age and sex incidences of those affected with shigellosis, the frequency of isolation of the different types of *Shigella* organisms, the clinical diagnosis given those cases, the comparative frequency of isolation of the *Shigella* organisms in the examination of rectal swab and the stool, and the percentage of isolation of the intestinal pathogens at the different periods (days) of the disease.

## PROCEDURES

*Rectal swab.*—A cotton-tipped swab kept sterile in a big test tube was inserted through the anus to reach the rectum and twisted around to get as much swab of the mucosa as possible. A plate of SS agar was directly streaked with this rectal swab. The plates of SS agar so streaked with the swabs obtained from the different patients were brought to the laboratory and incubated overnight. Suspicious colonies were inoculated into differential media (either Russell's double sugar or Kliger's medium). After an overnight incubation, the tubes presenting the characteristic of intestinal pathogens (acid or acid and gas in the butt and negative or alkaline reaction in the slant, or acid in the butt and slight acid reaction in the slant) were passed in different routine sugar media (lactose, saccharose, mannite, dextrose, xylose and occasionally rhamnose), tryptose broth and a slant of nutrient agar. The following day the sugar reactions were noted; motility and indol productions were determined in tryptose broth; and the serological confirmation was made from the slant agar. The cultural and biochemical reactions and the confirmatory serological findings were the bases for the identification of the *Shigella* organism.

* Read at the monthly seminar of the Manila Health Department on February 27, 1953.

*Stool culture.*—Stool specimens were collected in sterile glass containers which were properly covered and labelled. The samples were usually collected in the morning and taken to the laboratory where a big loopful from each sample was directly streaked on plates of SS agar. The plates were incubated overnight. In the identification of the organism, the same procedures used for rectal swabs were followed. The rest of the samples were examined for the cellular and other abnormal structures present and for ova of parasites by direct and concentration methods. The results obtained in these instances may be the subject of another paper.

In this connection, it may be mentioned that due to inadequacy of laboratory facilities, the authors were unable to follow other more elaborate procedures employed in other laboratories abroad such as the use of sterile rubber tubing for inserting the swabs, the use of enrichment media, and the employment of several selective and differential media which were not available at the time this investigation was being undertaken. It is admitted that the percentage of successful isolation is increased by using enrichment procedures and by streaking more differential and selective media.

The age and sex incidences are presented in Table 1. Fifty-seven and fifty-four hundredth per cent of the patients from

TABLE 1.—*Age and sex incidences.*

| Age groups | Males | | Females | | Total | |
|---|---|---|---|---|---|---|
| | Number | Per cent | Number | Per cent | Number | Per cent |
| 0–4 | 148 | 33.27 | 108 | 24.27 | 256 | 57.54 |
| 15–9 | 16 | 3.60 | 9 | 2.02 | 25 | 5.62 |
| 10–14 | 3 | 0.67 | 5 | 1.12 | 8 | 1.79 |
| 15–19 | 7 | 1.57 | 12 | 2.70 | 19 | 4.27 |
| 20–24 | 24 | 5.39 | 13 | 2.92 | 37 | 8.31 |
| 25–29 | 19 | 4.27 | 9 | 2.02 | 28 | 6.29 |
| 30–34 | 6 | 1.35 | 11 | 2.47 | 17 | 3.82 |
| 35–84 | 33 | 7.42 | 22 | 4.94 | 55 | 12.36 |
| Total | 256 | 57.54 | 189 | 42.46 | 445 | 100.00 |

whom the *Shigella* organisms were isolated are included in age group of 0 to 4 years, showing that shigellosis is mainly a disease of childhood. In this age groups, 33.27 per cent were males and 24.27 per cent, females. Of the total cases, 57.54 per cent were males and 42.46 per cent, females. Males apparently predominated over the females.

In Table 2, the frequency of the different types of *Shigella* isolated are presented. The diagnostic sera used in the classification of the cultures were those prepared by the Lederle

Laboratories Division, American Cyanamid Company, New York, N. Y., U. S. A. *Shigella flexneri* II, constituted 42.93 per cent; *Shigella flexneri* III, 34.16 per cent; *Shigella sonnei*, 9.44 per cent; and *Shigella dysenteriæ*, 5.62 per cent. The other types were relatively infrequent. From three patients, two species or serological types of *Shigella*, were isolated. In one *S. flexneri* II and XIV were present and in the other two, *S. flexneri* II and *S. sonnei*.

TABLE 2.—*Frequency of different types of Shigella isolated.*

| Types of Shigella* | Frequency | |
|---|---|---|
| | Number | Per cent |
| *Shigella dysenteriae* | 25 | 5.62 |
| *Shigella ambigua* | 7 | 1.57 |
| *Shigella sonnei* | 42 | 9.44 |
| *Shigella flexneri* I | 6 | 1.35 |
| II | 191 | 42.93 |
| III | 152 | 34.16 |
| IV | 1 | 0.22 |
| V | 7 | 1.57 |
| VII | 2 | 0.45 |
| VIII | 11 | 2.47 |
| XIV | 1 | 0.22 |
| Total | 445 | 100.00 |

* Diagnostic sera prepared by Lederle Laboratories Division, American Cyanmid Company, New York, N. Y.

The different clinical diagnoses given to these cases from whom *Shigella* organisms were isolated are given in the order of their frequency in Table 3. Ileocolitis acute was labelled in 64.29 per cent; bacillary dysentery, in 18.44 per cent; amebic dysentery, in 4.72 per cent; gastritis, acute, in 4.04 per cent; dyspepsia, in 2.02 per cent; etc.

TABLE 3.—*Clinical diagnosis of cases.*

| Clinical diagnosis | Number | Per-centage |
|---|---|---|
| Ileocolitis, Acute | 236 | 64.29 |
| Dysentery, Bacillary | 82 | 18.42 |
| Dysentery, Amebic | 21 | 4.74 |
| Gastroenteritis, Acute | 18 | 4.02 |
| Dyspepsia | 9 | 2.04 |
| Gastritis | 5 | 1.12 |
| Ascariasis | 5 | 1.12 |
| Influenza | 4 | 0.90 |
| Brochopneumonia | 4 | 0.90 |
| Indigestion | 2 | 0.45 |
| Colitis | 2 | 0.45 |
| Malnutrition | 2 | 0.45 |
| Food poisoning | 1 | 0.22 |
| Measles with Bronchopneumonia | 1 | 0.22 |
| Bronchitis, Acute | 1 | 0.22 |
| Schistosomiasis | 1 | 0.22 |
| Chicken pox | 1 | 0.22 |
| Total | 445 | 100.00 |

Table 4 shows that 4,563 samples were examined from the patients; 3,292 rectal swabs and 1,273 stools. Of the rectal swabs, 17.36 per cent yielded positive findings and of the stool examinations, 14.92 per cent were positive for *Shigella* organisms.

TABLE 4.—*Frequency of isolation in different samples.*

| Samples | Positive | | Negative | | Total | |
|---|---|---|---|---|---|---|
| | Number | Per cent | Number | Per cent | Number | Per cent |
| Rectal swab | 571 | 17.36 | 2,719 | 82.64 | 3,290 | 100.00 |
| Stool | 190 | 14.92 | 1,083 | 85.08 | 1,273 | 100.00 |
| Total | 761 | 16.68 | 3,802 | 83.32 | 4,563 | 100.00 |

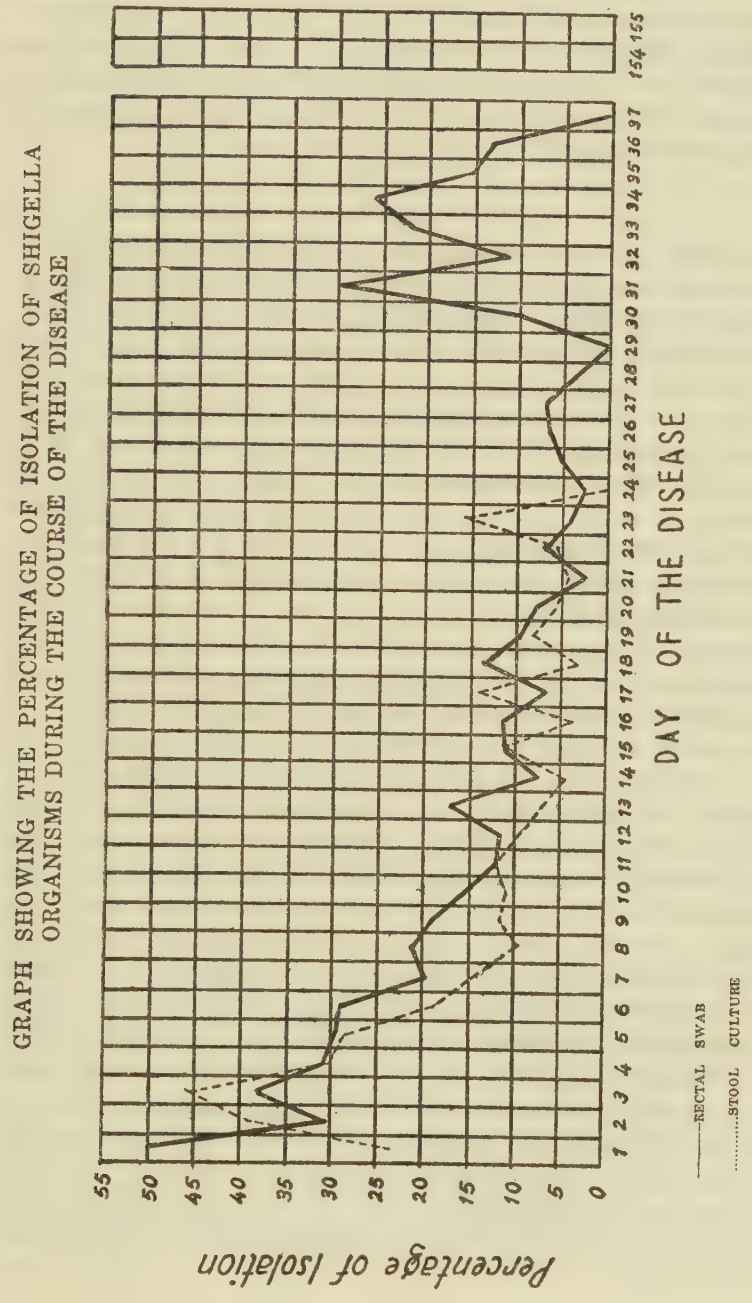
The authors had the opportunity of studying 391 cases wherein rectal swabs were examined at the same time that the stools were also submitted for examination. As shown in Table 5, the rectal swabs were positive in 58.06 per cent and the stool in 27.62 per cent. Both samples were positive for dysentery organism in 14.32 per cent. If all the percentage of isolation by rectal swab and stool examination, were combined, the success in the former procedure is 72.38 per cent, as compared to 41.94 per cent of the latter.

TABLE 5.—*Comparative success of isolation from two samples.*

| Samples | Number | Per cent |
|---|---|---|
| Rectal swab only | 227 | 58.06 |
| Stool only | 108 | 27.62 |
| Both rectal swab and stool | 56 | 14.32 |
| Total | 391 | 100.00 |

The following graph shows the percentage of isolation of *Shigella* organisms during the course of the disease. It may be mentioned in this connection that an existing rule that patients suffering from Shigellosis should only be released from the hospital after three consecutive negative culture findings was followed. The continuous line represents the daily percentage of isolation of the organism during the patient's stay in the ward. In the first day of the disease, 50 per cent of rectal swabs were positive. This daily curve gradually went down with a rise from the 29th day and then gradually to the 37th day when none of the cases under study

gave further positive findings. The longest time of observation made was up to the 155th day of the disease.


GRAPH SHOWING THE PERCENTAGE OF ISOLATION OF SHIGELLA ORGANISMS DURING THE COURSE OF THE DISEASE
Percentage of Isolation
55 50 45 40 35 30 25 20 15 10 5 0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37
154 155
DAY OF THE DISEASE
——RECTAL SWAB
.....STOOL CULTURE

The interrupted line represents the percentage of stool cultures found positive during the same course of the disease. It would be observed that this curve is similar to the former. It shows, however, that the success of isolation is proportionately lower than that of the swab culture, and that after the 23rd day of the disease no positive findings were obtainable unlike that of the swab culture which shows that positive isolations were possible up to the 36th day.

## DISCUSSION

For a total period of 18 months (June, 1951 to December, 1952) the authors isolated dysentery organisms from 445 cases in San Lazaro Hospital. Based on their bacteriological findings, the cases may be properly labelled as shigellosis. Their study shows that 57.54 per cent of the cases are included in the age group of 0 to 4 years, meaning that shigellosis is mainly a disease of infancy. Considering that gastroenteritis as a disease ranks No. 1 in morbidity and fatality in childhood,[1] in planning or proposing any preventive measure against gastroenteritis, attention should first be focused toward children. Vaccination, if still believe to be relied upon as of any use, should be given to them.

The types of dysentery organism responsible for the production of shigellosis vary in different countries. The predominating serologic type likewise varies at different months of the year or at different years. This may be influenced by the presence and frequency of dysentery reservoirs and the factors responsible in their spread to the population. Smith and Conant[2] in their recent statistical data on the incidence of *Shigella* species in the United States of America cites that *S. dysenteriæ* and *S. ambigua* were relatively rare (1937 to 1942), *S. sonnei* in about one-third of the cases and *S. flexneri* in about two-thirds of instances. In British Middle East (1940 to 1943), *S. dysenteriæ* was found in about 20 per cent of the cases, *S. ambigua* in about 6 per cent, *S. sonnei,* 7 per cent and *S. flexneri* in about 61 per cent. In India and New Guinea (1938 to 1945), *S. dysenteriæ* were isolated from 12.5 per cent of the cases, *S. ambigua* in about 8 per cent of in-

[1] Dr. Angel Alomia, Chief, Division of Preventable Diseases, in a personal communication to the authors.

[2] Smith, D. T., and N. F. Conant. Zinsser's textbook of bacteriology (10th ed., New York, Appleton–Century–Crofts, Inc., 1952) 470.

stances, *S. sonnei* in 0.2 to 16.4 per cent and *S. flexneri* in 65 to 80 per cent. Guidote, et al.[3] in 1930 to 1938 reported that *S. dysenteriæ* was found in 19.6 per cent of the cases, *S. flexneri* in 75.6 per cent and unspecified, 4.8 per cent. The senior author[4] in his study of diarrhea and dysentery reported that *S. dysenteriæ* was isolated in 15.3 per cent, *S. ambigua,* 17.6 per cent, *S. flexneri* 43.5 per cent, *S. sonnei,* 13 per cent, *S. dispar,* 9.4 per cent, and *S. alkalescens,* 1.2 per cent of the cases. Lantin and Geronimo[5] found out that *S. dysenteriæ, S. ambigua,* and *S. sonnei* were relatively infrequent. As in findings abroad, *S. flexneri* predominated. The frequency of the different serological types of *S. flexneri* was given as follows: *S. flexneri* type I, 14.46 per cent; type II, 37.03 per cent; type III, 39.52 per cent and the rest in an insignificant percentage.

It may be noted that before the Second World War, *S. dysenteriæ* was found in about one-fifth of the cases in the Philippines, but after liberation this organism seems to have been rarely identified.

Using the Lederle dysentery diagnostic sera, the authors have presented the frequency of the different *Shigella* types isolated from their cases. *S. dysenteriæ,* practically unknown especially in the City of Manila after liberation, was isolated in 5.62 per cent of cases, *S. ambigua,* in 1.57 per cent and *S. sonnei* in 9.44 per cent. Of the different serologic types of *S. flexneri,* type I was isolated in 1.35 per cent; type II, in 42.93 per cent; type III, in 34.16 per cent; and the rest, in relatively insignificant instances. It is clear that at least among their cases, *S. flexneri* types II and III constituted 77.09 per cent. In public health activities, the predominating types of the most frequent species of *Shigella* should be taken into consideration.

It is of interest to know the clinical diagnosis given on these cases of shigellosis. In Table 3, the most frequent clinical labels given are ileocolitis, acute, and bacillary dysentery. The other clinical diagnoses are given in a relatively few instances.

[3] Guidote, J., M. Aycardo, and G. de la Paz. Some epidemiologic features of dysentery in the City of Manila. Philip. Med. Assoc. Jour. 20 (1940) 317–337.

[4] De Roda, A. P. The bacteriology of the ileocolities and diarrheas among children. Philip. Is. Med. Assoc. Jour. 19 (1939) 73–78.

[5] Lantin, P., and A. Geronimo. Studies on *Shigella* infection (1948). Unpublished.

Of the samples examined, the rectal swabs were made practically everyday, while the stool specimens were obtained when available only. Of a total of 4,563 bacteriological examinations made on these 445 cases, 16.68 per cent were positive. Similarly, on 3,292 rectal swabs, 17.36 per cent were positive, and on 1,273 stool examinations, 14.92 per cent were positive. These findings showed a relatively higher incidence of isolation of the intestinal pathogen in rectal swab than in the stool culture.

To have a more vivid comparison of the success of isolation in rectal swab and stool, the authors studied 391 cases in which the stool examination was done on the same day that the rectal swab was examined. The results in Table 5 shows that in 58.06 per cent, the organism was isolated in rectal swab only; in 27.62 per cent, in stool only; and 14.32 per cent, in both rectal swab and stool. From these findings, positive rectal swab was observed in 72.38 per cent, and positive stool in 41.94 per cent. The higher incidence of successful isolation was made definitely in the rectal examination than in the stool examination. If a single procedure have to be adopted, the swab examination is preferrable.

In the accompanying graph the percentage of isolation of the organism at the different days of the disease is presented. During the first days of the disease, the incidence of isolation in both procedures was comparatively high, but still very much lower than what foreign laboratorists or workers claimed. The curve gradually went down. In the cases of rectal swab, a rise is observed from the 29th day to the 36th day. Thereafter, none of the cases shows positive findings. In the case of the stool, the last positive finding is noted on the 23rd day of the disease. The second rise in the graph curve in the case of rectal swab culture would suggest a carrier tendency. Another point of interest is the further proof of being able to isolate the organism longer in the course of the disease in rectal swab examination than in stool examination. It may also be stated that even in the 3rd week of the disease, the etiologic agent may still be isolated in about 10 per cent of cases using both procedures. The graph curve for the stool examination follows a similar course as that for the rectal swab, but in most instances, it shows the former procedure to be inferior to the latter.

Twenty-one (4.27 per cent) cases were also suffering from amebiasis. Two of these cases were diagnosed as carriers of *Endameba histolytica.*

## CONCLUSION

1. In the 445 cases *Shigella* organisms were mainly isolated from among the infants and young children (age group 0 to 4). Any public health measure directed against this disease should be concentrated primarily to this age group.

2. Of the different types of dysentery organism, the Flexner type predominated, and among the Flexners, types II and III constituted 77.09 per cent. *S. sonnei* was isolated in 9.44 per cent and *S. dysenteriæ* in 5.62 per cent. In the preparation of vaccines and in the study of antibiotics against shigellosis, these findings should be given utmost attention and consideration.

3. Most of the shigellosis cases were clinically diagnosed as acute ileocolitis, and bacillary dysentery.

4. A higher incidence of successful isolation is observed by using rectal swab instead of stool examination.

5. Dysentery organism may be isolated in any day up to the 23rd day of the disease in stool examination and up to the 36th day of the disease in rectal swab.

6. Rectal swab examination seems to be a far more superior procedure than stool examination.

7. Amebiasis in combination with shigellosis was observed in 10 cases. Two serological types of *Shigella* were isolated from three patients.

8. Twenty-four cases were suffering from double infections; twenty-one with *Endameba histolytica* and three with other serological types of *Shigella.*

## ACKOWLEDGMENT

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# COMPOSITION OF PHILIPPINE FOODS, III

By Carmen Ll. Intengan, Leon G. Alejo, Velona A. Corpus, Rosita D. Salud, Isabel del Rosario, Rosario Gomez, Jesusa Henson, and Isabel Concepcion

*Foods and Nutritional Biochemistry Laboratory*
*Institute of Nutrition, Manila*

TWO TEXT FIGURES

This report is the third of a series of analyses made on Philippine food materials. The first paper (1953) reported on 108 samples representing 73 different fruits and vegetables. The second report (1954) covered 167 samples which included roots, bulbs and tubers, pulses, nuts and seeds, besides fruits and vegetables. Data from 77 muscle cuts and 69 organ meats of livestock, poultry and game are covered in this report.

Some data are reported on the proximate and mineral composition of our local meat and meat products [Adriano and Tavanlar (1925); Adriano and De Guzman (1932); Gutierrez (1939)] but a comprehensive study on the mineral and vitamin content of meats and organ meats used in the Filipino dietary is not available at the present time.

This study presents data on the moisture, ether extract, nitrogen, ash, calcium, phosphorus, iron, carotene, thiamine, riboflavin, niacin and ascorbic acid contents of samples of beef, pork, carabao, deer, lamb, goat, rabbit, and fowls such as chicken, turkey, duck, goose, pigeon, and others, and their corresponding organ meats used by Filipinos for food. The vitamin A content of meats and organ meats is contemplated to be the subject of another paper.

## EXPERIMENTAL METHODS

Samples used for analysis were obtained from the public markets of Manila and Pasay City, the Manila slaughter house, and from animals slaughtered in the laboratory, in the case of cuts of meat like lamb, goat meat, etc. which are not common and ordinarily available in market places. Whole organs and 1 to 2-pound portions of muscle meats were cut into small pieces and ground in a Waring Blendor. Extraneous fat and connective tissue that accompanied the sample were removed before grinding. While the food value of fats, ligaments, tendons or even cartilages, which are also used in the preparation

of native dishes, is not minimized, these parts were removed in order to get a thoroughly uniform sample from the raw meat cuts. Exceptions to this sampling are certain parts of the carcass like the tails, pig's feet, lungs, stomach, the small and large intestines, etc. which, due to the nature of their tissue structure, contain very little, if at all, of muscle meat. In several meat samples like the leg muscle, rib portions, plate muscle, etc., analyses were made on the lower, middle, and upper portions of the sample and average results are reported. Each sample was stored in an amber colored bottle and kept frozen until ready for analysis. Analyses were usually completed within the week of the sampling. The mineral and vitamin determinations were made on duplicate samples.

The analytical methods used in this study are the same as those reported in the first paper (1953). Ascorbic acid was determined only on some of the organ meats. The analysis for carotene was also limited to a few samples.

## RESULTS AND DISCUSSION

The nutrient values of different cuts of meat and organ meats are shown in the accompanying table. Some of the values, especially on the vitamins, may vary widely. The age and diet of the animal are two of the factors known to affect tissue composition.

*Muscle cuts.*—The different cuts of meat are illustrated in figures 1 and 2. In general, meat averages about 75 per cent, water; 20 to 25 per cent, protein; and 1 per cent, ash. The nitrogen content of the meat of the different animals are comparable in amount. The proportion of fat is highest in pork and lowest in carabao meat.

The ash content of meat samples is more or less proportional to the percentage of nitrogen. Muscle meats are a poor source of calcium. This study gives a range of 4 to 30 mg per cent calcium with many of the values below 10 mg. The iron content varies from less than 1 to 3 mg per cent while phosphorus is present at a higher percentage—100 to 200 mg per cent. The carotene content of muscle meat is found in negligible amount. Pork muscle cuts contain the highest thiamine compared to other meats. It averages approximately 0.4 mg per cent compared to 0.04 mg per cent in beef, 0.03 mg per cent in carabao meat, and 0.1 mg per cent in goat meat, venison and mutton. The riboflavin content of goat meat which aver-

ages 0.5 mg per 100 gm is higher compared with 0.2 mg to 0.4 mg per 100 gm of pork, 0.2 mg per 100 gm of lamb, and 0.1 mg per 100 gm of venison, beef and carabao meat. The

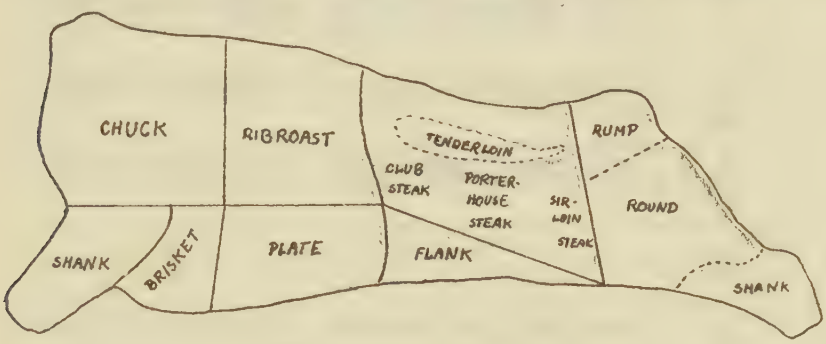


FIG. 1. Cuts of beef.*

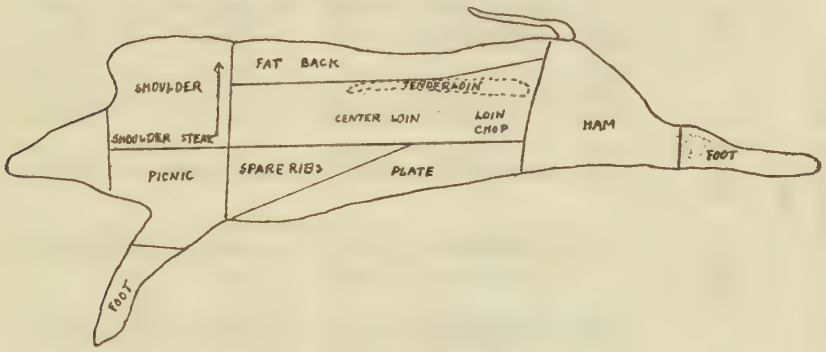


FIG. 2. Cuts of pork.*

niacin values vary from 3 mg per cent found in goat meat, to 9 mg per cent found in venison. The vitamin values of different cuts of meat from the same animal do not differ widely. Muscle meats may be considered as poor sources of vitamin C.

Compared with foreign values (Ch'en, et al., Oiso, and Leung, et al.), local muscle meats tend to be lower in fat, iron, and thiamine but slightly higher in riboflavin and niacin.

The meat of the rabbit compares favorably with that of chicken. In the case of chicken, pullet, turkey and goose, the dark meat was found to contain higher amounts of thiamine and riboflavin than white meat. However, in the case of pigeon, goose and "baliwis," the breast meat is higher in thiamine and riboflavin than the leg meat. In all other fowls, breast meat contains higher niacin than the leg meat.

* From the Meat Manual of the National Livestock and Meat Board of Chicago, Illinois.

MEAT CUTS

| Food sampled | | Moisture | Nitrogen | Ether extract | Ash | Calcium | Phosporus | Iron | Carotene | Thiamine | Riboflavin | Niacin | Ascorbic acid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Local name | English name | gm | gm | gm | gm | mg | mg | mg | mg | mg | mg | mg | mg |
| BABOY (Litsonin): | SUCKLING PIG: | | | | | | | | | | | | |
| Pata | Pig's feet | 74.5 | 3.186 | 5.39 | 1.02 | 8.92 | 162.56 | .64 | tr | .303 | .499 | 5.48 | |
| Tadyang, laman | Spare ribs | 70.3 | 2.721 | 11.13 | 1.03 | 8.24 | 162.20 | .83 | tr | .286 | .462 | 5.10 | |
| Tiyan, kalamnan | "Bacon" meat | 71.9 | 2.934 | 11.15 | 1.33 | 11.24 | 130.67 | .80 | tr | .224 | .404 | 4.58 | |
| BABOY: | PORK: | | | | | | | | | | | | |
| Buntot | Pig's tail | 38.3 | 2.464 | 46.11 | .55 | 45.68 | 74.03 | .67 | | .187 | .163 | 1.84 | |
| Kasim bandang ibaba | Picnic | 49.2 | 2.217 | | .61 | 7.11 | 100.36 | .42 | | .400 | .216 | 4.03 | |
| Likod | Fat back | 30.3 | 1.550 | 61.10 | .27 | 15.20 | 38.00 | tr | | .288 | .105 | 1.94 | |
| Liempo sa tian | Plate fat | 39.1 | 1.636 | 49.73 | .54 | 6.81 | 72.00 | .69 | tr | .191 | .126 | 4.02 | |
| Liempo, bandang hulihan | Loin chop | 38.7 | 1.819 | 48.04 | .56 | 7.86 | 82.01 | tr | | .413 | .181 | 4.83 | |
| Lomo | Tenderloin | 67.7 | 3.230 | 10.60 | 1.02 | 13.36 | 138.00 | 1.23 | | 1.097 | .273 | | |
| Pata | Pig's feet | 57.5 | 3.391 | 19.87 | .72 | 30.70 | 90.22 | .35 | | .484 | .240 | 3.81 | |
| Paypay | Shoulder (Boston butt) | 59.9 | 2.527 | 22.74 | .70 | 7.13 | 81.99 | tr | | .606 | .159 | 3.22 | |
| Paypay, laman | Shoulder steak | 64.9 | 3.137 | 15.59 | .93 | 9.82 | 96.14 | .63 | | .684 | .287 | 2.71 | |
| Pigi | Ham | 40.0 | 2.527 | 47.58 | .95 | 12.86 | 86.46 | .80 | | .231 | .211 | 6.30 | |
| Sitsaron | Crackling | 1.1 | 11.182 | 31.24 | .93 | 34.16 | 51.70 | 1.73 | | .010 | .032 | 1.95 | |
| Tadyang | Spare ribs | 54.8 | 1.952 | 27.50 | .75 | 11.68 | 98.05 | .63 | | .286 | .105 | | |
| Tagiliran, laman | Center loin | 35.7 | 2.003 | 52.06 | .56 | 8.57 | 89.61 | .28 | | .316 | .132 | 3.84 | |
| Ulo | Head | 42.8 | 2.575 | 40.90 | .44 | 13.43 | 60.61 | .43 | | .072 | .170 | 1.52 | |
| BAKA: | BEEF: | | | | | | | | | | | | |
| Bias | Shank | 73.2 | 3,467 | 3.38 | 1.00 | 6.14 | 138.03 | 1.79 | .0531 | .031 | .112 | 7.30 | |
| Buntot | Tail | | | | .51 | 13.16 | 70.26 | 1.54 | | .038 | .277 | 1.27 | |
| Kabilugan | Flank | 62.4 | 3.116 | 15.30 | 1.01 | 7.34 | 123.28 | .89 | | .031 | .152 | 6.46 | |
| Kadera, may buto | Rib roast | 48.9 | 2.418 | 28.20 | .78 | 6.67 | 103.59 | .48 | | .023 | .093 | 5.40 | |
| Paypay | Chuck | 65.2 | 2.689 | 15.40 | .93 | 11.77 | 117.86 | 1.59 | | .025 | .103 | 5.01 | |
| "Pierna corta" | | | | | | | | | | | | | |
| "Pierna larga" | Round | 73.2 | 3.523 | 2.05 | 1.13 | 6.24 | 133.07 | 1.91 | tr | .040 | .108 | 7.38 | |
| "Punta y pecho" | Brisket | 72.9 | 3.173 | 3.23 | 1.06 | 7.57 | 145.54 | 1.85 | .0829 | .026 | .120 | 6.37 | |
| Solomillo | Tenderloin | 74.3 | 3.732 | 2.09 | 1.13 | 7.12 | 176.38 | 1.40 | | .060 | .079 | 7.06 | |
| Tadyang | Plate | 68.8 | 2.907 | 14.50 | .84 | 25.64 | 131.56 | 1.45 | | .025 | .076 | 4.28 | |
| Tagiliran, laman hulihan | Sirloin steak | 72.9 | 3.413 | 4.22 | .96 | 7.84 | 160.16 | .78 | .0588 | .057 | .105 | 5.67 | |
| Do. gitna | Porterhouse steak | 73.1 | 3.746 | 1.28 | 1.12 | 6.13 | 170.48 | 1.39 | tr | .030 | .063 | 8.65 | |
| Do. unahan | Club steak | 73.0 | 3.691 | 1.32 | 1.14 | 5.56 | 176.38 | .96 | .0127 | .033 | .087 | 7.80 | |
| Tapadera | Rump | 74.4 | 3.308 | 2.35 | 1.03 | 6.62 | 149.69 | 1.52 | tr | .066 | .100 | 7.26 | |
| Ulo | Head | 69.9 | 3.998 | 4.20 | .50 | 28.43 | 44.17 | 2.45 | | .010 | .024 | 1.44 | |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| KALABAW: | | | | | | | | | | | | | |
| Bias | CARABAO: | 76.6 | 2.987 | .47 | 1.06 | 7.15 | 151.05 | 2.03 | ------ | .023 | .077 | 6.18 | ------ |
| Hita | Shank | 76.3 | 3.328 | .55 | 1.06 | 10.25 | 152.14 | 2.62 | ------ | .020 | .068 | 3.92 | ------ |
| Ipit | Round | 76.6 | 3.295 | .57 | 1.07 | 9.90 | 151.05 | 2.05 | ------ | .032 | .103 | 3.04 | ------ |
| Paypay | Shoulder | 76.2 | 2.853 | .54 | 1.07 | 9.36 | 139.31 | 1.72 | ------ | .024 | .091 | 5.21 | ------ |
| Tapadera | Rump | 77.1 | 2.906 | .65 | 1.03 | 8.34 | 152.79 | 1.12 | ------ | .038 | .111 | 3.96 | ------ |
| KAMBING: | GOAT: | | | | | | | | | | | | |
| Balikat | Shoulder | 75.9 | 2.784 | 2.26 | 1.02 | 10.97 | 133.71 | 1.21 | ------ | .102 | .550 | 3.08 | ------ |
| Bias | Shank | 76.0 | 3.163 | 1.12 | 1.09 | 7.42 | 163.61 | 1.78 | ------ | .108 | .568 | 3.52 | ------ |
| Binti | Leg | 77.2 | 2.725 | .44 | 1.03 | 9.80 | 159.23 | 1.74 | ------ | .109 | .556 | 3.24 | ------ |
| Dibdib | Breast | 77.5 | 2.833 | 1.18 | 1.02 | 9.91 | 148.93 | 1.23 | tr | .159 | .512 | 3.41 | ------ |
| Lig | Neck | 75.9 | 3.728 | 3.10 | .98 | 14.41 | 114.55 | .89 | ------ | .102 | .585 | 3.02 | ------ |
| Likod | Chuck | 77.9 | 3.257 | 1.55 | .97 | 12.00 | 127.27 | .85 | ------ | .102 | .560 | 3.59 | ------ |
| Lomo | Loin | 76.1 | 3.570 | .62 | 1.06 | 6.49 | 150.32 | .36 | ------ | .089 | .482 | 5.16 | ------ |
| Tadyang | Rib | 77.6 | 3.180 | 1.21 | 1.00 | 6.82 | 153.81 | 1.35 | ------ | .095 | .461 | 3.72 | ------ |
| Tiyan | Flank | 76.4 | 3.038 | 1.79 | .82 | 11.87 | 151.40 | .93 | ------ | .115 | .239 | 3.61 | ------ |
| KONEHO: | RABBIT: | | | | | | | | | | | | |
| Hita (3 months) | Leg meat | 77.4 | 2.468 | 3.13 | 1.07 | 16.06 | 172.82 | 1.26 | tr | .067 | .205 | 10.01 | ------ |
| Hita (8 months) | do. | 75.5 | 3.471 | 1.34 | 1.06 | 15.03 | 176.30 | .99 | tr | .067 | .121 | 9.02 | ------ |
| Laman (3 months) | White meat | 77.7 | 2.653 | 1.90 | .99 | 36.68 | 167.44 | 1.72 | tr | .061 | .106 | 9.31 | ------ |
| Laman (8 months) | do. | 74.8 | 3.162 | 2.78 | 1.17 | 31.47 | 195.60 | 1.03 | tr | .055 | .107 | 8.39 | ------ |
| TUPA: | LAMB: | | | | | | | | | | | | |
| Balikat | Shoulder | 71.4 | 2.571 | 7.67 | 1.04 | 15.67 | 146.36 | 1.34 | ------ | .133 | .200 | 5.29 | ------ |
| Bias, harapan | Fore shank | 72.8 | 3.176 | 6.06 | .97 | 16.40 | 131.36 | .54 | ------ | .097 | .159 | 4.96 | ------ |
| Bias, likod | Hind shank | 72.5 | 3.298 | 4.58 | 1.09 | 7.27 | 107.74 | 1.51 | ------ | .129 | .205 | 6.48 | ------ |
| Lig | Neck | 71.3 | 3.027 | 7.31 | .95 | 10.02 | 132.41 | .96 | ------ | .082 | .133 | 4.28 | ------ |
| Lomo | Loin | 73.1 | 3.237 | 4.67 | 1.04 | 8.20 | 141.09 | 1.36 | ------ | .136 | .216 | 6.83 | ------ |
| Tadyang, dibdib | Riblets | 70.3 | 2.696 | 9.89 | 1.00 | 12.57 | 156.15 | 1.45 | ------ | .090 | .134 | 5.49 | ------ |
| Tadyang, likod | Rib roast | 71.7 | 3.065 | 5.83 | 1.14 | 17.69 | 131.22 | 1.82 | ------ | .097 | .147 | 5.91 | ------ |
| Tiyan | Flank | 70.3 | 2.663 | 9.16 | .87 | 11.11 | 124.39 | 1.01 | ------ | .086 | .132 | 4.32 | ------ |
| USA: | DEER: | | | | | | | | | | | | |
| Binti | Leg meat | 76.2 | 3.512 | .24 | 1.17 | 11.83 | 170.54 | 1.32 | tr | .147 | .128 | 8.53 | ------ |
| Tadyang | Rib meat | 75.2 | 3.499 | .12 | 1.17 | 19.09 | 158.28 | 3.69 | tr | .090 | .113 | 7.12 | ------ |

*Analysis of Philippine foods*

FOWLS AND POULTRY

| Food sampled | | Moisture | Nitrogen | Ether extract | Ash | Calcium | Phosporus | Iron | Carotene | Thiamine | Riboflavin | Niacin | Ascorbic acid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Local name | English name | | | | | | | | | | | | |
| | | *gm* | *gm* | *gm* | *gm* | *mg* | *mg* | *mg* | *mg* | *mg* | *mg* | *mg* | *mg* |
| AGATSONA: | SNIPE: | | | | | | | | | | | | |
| Laman | Meat | 72.6 | 3.363 | 3.18 | 1.24 | 28.81 | 218.95 | 3.69 | ---- | .291 | 1.031 | 8.67 | ---- |
| BALIWIS: | WILD DUCK: | | | | | | | | | | | | |
| Hita | Leg meat | 77.5 | 3.121 | .78 | 1.22 | ---- | 185.99 | 1.76 | tr | .084 | .892 | 4.33 | ---- |
| Dibdib | Breast meat | ---- | 3.189 | .59 | .82 | 9.58 | 90.66 | 1.02 | tr | .164 | 1.451 | 9.87 | ---- |
| GANSA: | GOOSE: | | | | | | | | | | | | |
| Hita | Leg meat | 72.9 | 3.685 | 3.88 | 1.01 | 8.37 | 188.09 | 2.77 | ---- | .092 | .264 | 6.89 | ---- |
| Dibdib | Breast meat | 71.4 | 3.737 | 3.17 | 1.06 | 9.61 | 190.07 | 1.28 | ---- | .129 | .492 | 12.15 | ---- |
| KALAPATI: | PIGEON: | | | | | | | | | | | | |
| Hita | Leg meat | 63.7 | 2.334 | 20.07 | .69 | 10.20 | 217.96 | .62 | .0077 | .150 | .413 | 2.94 | ---- |
| Dibdib | Breast meat | 66.8 | 2.735 | 15.44 | 1.00 | 15.61 | 284.11 | .36 | .0102 | .222 | 1.818 | 5.66 | ---- |
| KALAPATI (Pitson): | SQUAB: | | | | | | | | | | | | |
| Laman | Meat | 73.2 | 2.725 | 9.48 | 1.07 | 11.58 | 179.83 | 2.96 | tr | .247 | 1.769 | 8.02 | ---- |
| MANOK: | CHICKEN: | | | | | | | | | | | | |
| Hita | Dark meat | 72.1 | 3.614 | .05 | 1.00 | 4.10 | 86.27 | 1.00 | tr | .113 | .066 | 5.16 | ---- |
| Pitso | White meat | 73.6 | 3.726 | .01 | 1.08 | 3.88 | 171.45 | .69 | tr | .040 | .022 | 11.74 | ---- |
| MANOK (Dumalaga): | PULLET: | | | | | | | | | | | | |
| Hita | Dark meat | 73.2 | 3.140 | 2.72 | 1.04 | 9.79 | 156.79 | 1.59 | tr | .115 | .122 | 6.05 | ---- |
| Pitso | White meat | 71.5 | 3.500 | .50 | 1.17 | 13.73 | 181.04 | .38 | tr | .024 | .071 | 13.00 | ---- |
| PABO: | TURKEY: | | | | | | | | | | | | |
| Hita | Dark meat | 76.3 | 3.241 | 2.12 | 1.04 | 7.94 | 141.40 | 1.03 | ---- | .090 | .282 | 4.69 | ---- |
| Pitso | White meat | 73.7 | 3.862 | .39 | 1.01 | 7.37 | 184.87 | 1.22 | ---- | .027 | .107 | 10.66 | ---- |
| PATO: | DUCK: | | | | | | | | | | | | |
| Hita | Dark meat | 70.7 | 3.161 | 6.02 | 1.07 | 10.90 | 163.84 | 2.79 | tr | .176 | .378 | 4.12 | ---- |
| Pitso | White meat | 70.7 | 3.729 | 1.71 | 1.25 | 6.83 | 202.83 | 2.75 | tr | .154 | .385 | 11.66 | ---- |
| MISCELLANEOUS | | | | | | | | | | | | | |
| PAGONG: | TURTLE: | | | | | | | | | | | | |
| Laman | Meat | 77.3 | 3.060 | .16 | .76 | 26.85 | 86.51 | .74 | ---- | .197 | .450 | 2.98 | ---- |
| PALAKA: | FROG: | | | | | | | | | | | | |
| Laman | Meat | 78.0 | 3.222 | .84 | 1.02 | 43.45 | 168.82 | 1.45 | ---- | .080 | .130 | 5.92 | ---- |

## *Analysis of Philippine foods*

### ORGAN MEATS

| Food sampled | | Moisture | Nitrogen | Ether extract | Ash | Calcium | Phosporus | Iron | Carotene | Thiamine | Riboflavin | Niacin | Ascorbic acid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Local name | English name | | | | | | | | | | | | |
| | | *gm* | *gm* | *gm* | *gm* | *mg* | *mg* | *mg* | *mg* | *mg* | *mg* | *mg* | *mg* |
| ATAY: | LIVER: | | | | | | | | | | | | |
| Baboy, litsonin | Suckling | 73.3 | 2.552 | 2.82 | 1.32 | 11.94 | 184.14 | ---- | tr | .373 | 2.589 | 8.09 | ---- |
| Baboy | Pork | 74.7 | 2.799 | 2.29 | 1.31 | 9.77 | 230.09 | 10.16 | tr | .283 | 1.406 | 13.69 | 23.25 |
| Baka (luto) | Beef (cooked) | 70.6 | 3.708 | 3.11 | 1.37 | 14.70 | 207.10 | 4.06 | ---- | .278 | 3.522 | 12.11 | 33.00 |
| Gansa | Goose | ---- | 3.563 | ---- | 1.39 | 7.10 | 163.75 | 6.41 | .0378 | .388 | 2.874 | 11.51 | ---- |
| Kalabaw | Carabao | 74.1 | 2,475 | 1.73 | 1.11 | 16.00 | 206.94 | 6.79 | tr | .170 | 1.540 | 11.08 | 22.35 |
| Kambing | Goat | 70.6 | 3.528 | 3.39 | 1.34 | 16.52 | 171.98 | 1.04 | .0130 | .512 | 2.788 | 10.58 | ---- |
| Koneho | Rabbit | 74.5 | 2.470 | 2.49 | 1.01 | 9.59 | 178.75 | 3.34 | tr | .280 | 4.860 | 16.91 | ---- |
| Manok | Chicken | 72.7 | 2.898 | 3.87 | 1.28 | 13.59 | 151.71 | 3.48 | .1329 | .300 | 4.486 | 11.20 | 34.82 |
| Pabo | Turkey | ---- | 2.767 | ---- | 1.16 | 8.91 | 184.88 | 2.26 | .1162 | .238 | 2.458 | 15.63 | ---- |
| Pato | Duck | ---- | 2.636 | ---- | 1.17 | 14.89 | 166.68 | 5.60 | 1.6300 | ---- | ---- | 8.95 | ---- |
| Tupa | Sheep | 69.8 | 3.483 | 3.98 | 1.34 | 20.75 | 269.87 | 4.54 | .0363 | .387 | 9.113 | 16.07 | ---- |
| BAGA: | LUNGS: | | | | | | | | | | | | |
| Baboy, litsonin | Suckling | 82.4 | 2.312 | ---- | .87 | 13.89 | 192.75 | 5.15 | tr | .106 | .566 | 2.44 | ---- |
| Baboy | Pork | 84.1 | 1.600 | 1.83 | .83 | 13.48 | 124.85 | 1.09 | tr | .117 | .256 | 3.77 | 10.41 |
| Baka | Beef | 77.9 | 2.736 | 1.91 | 1.00 | 22.40 | 137.50 | 1.55 | .1886 | .099 | .267 | 3.48 | ---- |
| Kalabaw | Carabao | 81.0 | 2.977 | 1.43 | .80 | 20.22 | 53.15 | 1.55 | tr | .073 | .233 | 2.81 | 17.74 |
| Kambing | Goat | 78.2 | 2.727 | 2.13 | 1.09 | 14.51 | 141.56 | 2.48 | tr | .099 | 1.157 | 2.93 | ---- |
| Tupa | Sheep | 77.4 | 2.769 | 1.71 | 1.12 | 19.37 | 172.27 | 1.76 | ---- | .095 | .430 | 4.20 | ---- |
| BAHAY-GUYA: | UTERUS: | | | | | | | | | | | | |
| Baboy | Pig | 84.1 | 2.170 | .80 | .53 | 12.06 | 92.60 | 1.41 | ---- | .050 | .118 | 1.55 | ---- |
| Baka | Cow | 82.1 | 2.819 | .31 | .53 | 26.40 | 78.41 | 1.00 | ---- | .042 | .129 | 1.17 | ---- |
| BALUN-BALUNAN: | GIZZARD: | | | | | | | | | | | | |
| Gansa | Goose | ---- | 3.502 | ---- | .89 | 2.16 | 112.65 | .82 | ---- | .079 | .901 | 5.81 | ---- |
| Manok | Chicken | 73.8 | 3.483 | .95 | .94 | 18.30 | 71.50 | .59 | tr | .058 | .248 | 4.79 | 3.97 |
| Pabo | Turkey | ---- | 3.353 | ---- | 1.00 | 6.36 | 117.32 | 1.33 | tr | .067 | .244 | 5.94 | ---- |
| Pato | Duck | ---- | 4.006 | ---- | .92 | 11.40 | 118.98 | 2.92 | ---- | ---- | ---- | 5.37 | ---- |
| BATO: | KIDNEY: | | | | | | | | | | | | |
| Baboy, litsonin | Suckling | 79.3 | 2.548 | 3.43 | 1.14 | 16.55 | 200.02 | 2.17 | tr | .317 | 2.574 | 7.83 | ---- |
| Baboy | Pork | 78.9 | 2.376 | 3.70 | 1.11 | 9.21 | 196.16 | 5.25 | tr | .421 | 1.606 | 10.76 | 13.65 |
| Baka | Beef | 80.5 | 2.454 | 1.69 | 1.09 | 23.81 | 158.25 | 2.13 | .5444 | .229 | 3.303 | 6.15 | 15.20 |
| Kalabaw | Carabao | 82.1 | 2.237 | 1.81 | 1.01 | 13.52 | 308.65 | 2.92 | tr | .220 | 2.670 | 6.16 | 15.31 |
| Kambing | Goat | 79.0 | 2.550 | 3.54 | 1.19 | 15.13 | 188.76 | 1.89 | tr | .647 | 5.695 | 4.82 | ---- |
| Tupa | Lamb | ---- | 2.596 | ---- | 1.50 | 17.51 | 212.46 | 4.22 | tr | .594 | 5.670 | 9.15 | ---- |

*Analysis of Philippine foods*

ORGAN MEATS—Continued.

| Food sampled | | Moisture | Nitrogen | Ether extract | Ash | Calcium | Phosporus | Iron | Carotene | Thiamine | Riboflavin | Niacin | Ascorbic acid |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Local name | English name | gm | gm | gm | gm | mg | mg | mg | mg | mg | mg | mg | mg |
| BITUKA, MALAKI: | LARGE INTESTINES: | | | | | | | | | | | | |
| Baboy, litsonin | Suckling | 80.5 | 1.461 | 2.45 | 1.03 | 14.71 | 94.07 | .49 | tr | .086 | .351 | 1.33 | ------- |
| Baboy | Pig | 83.1 | 1.618 | .18 | .51 | 9.95 | 84.47 | 1.76 | tr | .078 | .126 | 2.10 | 4.13 |
| Baka | Cow | 78.2 | 1.957 | 8.02 | .53 | 15.03 | 58.89 | tr | .0721 | .049 | .315 | 1.67 | ------- |
| Kalabaw | Carabao | 73.1 | 1.487 | 11.88 | .49 | 16.52 | 61.07 | .87 | .0031 | .028 | .101 | 1.18 | 3.99 |
| Kambing | Goat | 86.9 | 1.758 | 1.95 | ------- | ------- | ------- | ------- | ------- | .038 | .136 | .45 | ------- |
| BITUKA, MALIIT: | SMALL INTESTINES: | | | | | | | | | | | | |
| Baboy, litsonin | Suckling | 85.1 | 1.996 | .92 | .88 | 8.92 | 157.88 | 2.51 | tr | .182 | .417 | 2.02 | ------- |
| Baboy | Pig | 83.4 | 2.020 | 3.70 | .89 | 9.55 | 142.43 | 2.39 | tr | .152 | .235 | 3.26 | 14.42 |
| Baka | Cow | 76.7 | 2.246 | 7.18 | .60 | 13.64 | 114.76 | 4.01 | .1374 | .084 | .189 | 2.64 | ------- |
| Kalabaw | Carabao | 74.4 | 1.664 | 9.72 | .79 | 16.29 | 142.17 | 1.67 | .0083 | .063 | .181 | 3.02 | 16.26 |
| Kambing | Goat | 86.3 | 1.628 | 3.42 | .53 | 20.29 | 85.99 | .55 | ------- | .044 | .188 | .74 | ------- |
| DILA: | TONGUE: | | | | | | | | | | | | |
| Baboy | Pig | 53.8 | 2.226 | 23.78 | .81 | 16.64 | 115.54 | 1.10 | tr | .170 | .207 | 3.35 | ------- |
| Baka | Beef | 62.9 | 1.941 | 18.56 | .80 | 14.10 | 120.62 | 1.29 | tr | .108 | .233 | 3.35 | ------- |
| DUGO: | BLOOD: | | | | | | | | | | | | |
| Baboy, litsonin | Suckling | 85.3 | 1.838 | .03 | .60 | 8.25 | 21.63 | .34 | ------- | .007 | .013 | .68 | ------- |
| Baboy | Pig | 85.5 | 1.875 | .07 | 1.19 | 9.78 | 29.79 | 1.07 | ------- | .005 | .012 | .26 | ------- |
| Baka | Cow | 77.2 | 3.502 | 1.12 | 1.36 | 7.35 | 23.66 | 1.32 | ------- | .001 | .026 | 1.18 | ------- |
| LAPAY: | SPLEEN: | | | | | | | | | | | | |
| Baboy, litsonin | Suckling | 78.8 | 2.505 | 3.04 | ------- | ------- | ------- | ------- | ------- | .194 | .660 | 2.35 | ------- |
| Baboy | Pork | 78.6 | 2.634 | 2.51 | 1.31 | 6.30 | 179.53 | 4.56 | tr | .274 | .252 | 7.30 | 15.63 |
| Baka | Beef | 78.0 | 2.748 | 1.69 | 1.28 | 10.91 | 201.16 | 9.67 | .2447 | .154 | .439 | 4.73 | 28.86 |
| Kalabaw | Carabao | 78.1 | 3.388 | 1.45 | 1.33 | 13.05 | 103.42 | 5.40 | tr | .117 | .463 | 4.85 | 30.22 |
| Tupa | Lamb | ------- | 3.376 | ------- | ------- | ------- | ------- | ------- | tr | .114 | .184 | 4.58 | ------- |
| LABRILYO: | OMASSUM: | | | | | | | | | | | | |
| Baka | Cow | 83.3 | 2.399 | 2.76 | .91 | 102.22 | 105.40 | tr | .0361 | .026 | .103 | 1.16 | ------- |
| Kalabaw | Carabao | 90.5 | 1.396 | .17 | .48 | 147.87 | 46.06 | .38 | tr | .009 | .080 | .76 | tr |
| MANSANILYA: | RETICULUM: | | | | | | | | | | | | |
| Baka | Cow | 72.6 | 2.426 | 9.84 | .67 | 17.91 | 110.39 | .57 | .1450 | .099 | .219 | 1.55 | ------- |
| Kalabaw | Carabao | 78.3 | 1.794 | 6.91 | .72 | 13.38 | 221.94 | 1.90 | .0022 | .162 | .377 | 2.73 | 7.38 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PUSO: | | | | | | | | | | | | |
| HEART: | | | | | | | | | | | | |
| Baboy, litsonin | 75.3 | 2.681 | 8.94 | .84 | 7.72 | 139.82 | 1.56 | tr | .403 | 1.364 | 4.00 | |
| Baboy | 77.9 | 2.567 | 1.72 | 1.33 | 4.76 | 138.92 | 1.52 | tr | .339 | 1.767 | 6.49 | 3.82 |
| Baka | 75.0 | 3.008 | 5.88 | .98 | 10.94 | 170.13 | 4.12 | .0474 | .480 | .873 | 6.81 | 14.62 |
| Kalabaw | 76.1 | 2.781 | 4.62 | .97 | 10.07 | 156.05 | 2.49 | tr | .244 | 1.197 | 6.86 | 6.85 |
| Kambing | 75.2 | 2.736 | 5.85 | 1.01 | 8.17 | 154.07 | 2.27 | | .609 | 3.818 | 5.37 | |
| Tupa | | 2.890 | | .97 | 9.64 | 151.38 | 2.58 | tr | .700 | .770 | 5.20 | |
| SIKMURA: | | | | | | | | | | | | |
| STOMACH: | | | | | | | | | | | | |
| Suckling | 80.2 | 2.293 | 4.22 | .73 | 11.02 | 131.35 | 1.42 | tr | .089 | .523 | 2.12 | |
| Baboy | 78.5 | 2.403 | 5.64 | .63 | 11.20 | 94.20 | .37 | tr | .112 | .240 | 2.62 | |
| Baka | 78.5 | 2.423 | 5.56 | .55 | 52.70 | 51.42 | .39 | .0376 | .044 | .173 | 1.62 | |
| Kalabaw | 80.0 | 2.996 | .71 | .73 | | 54.75 | .38 | .0116 | .022 | .118 | 3.51 | tr |
| Kambing | 86.7 | 1.568 | 1.07 | .52 | 47.85 | 84.28 | .62 | | .057 | .349 | .72 | |
| SINUSO: | | | | | | | | | | | | |
| MAMMARY: | | | | | | | | | | | | |
| Baka | 12.7 | .605 | 83.1 | .14 | 5.15 | 14.76 | .34 | | .021 | .094 | .62 | |
| UTAK: | | | | | | | | | | | | |
| BRAIN: | | | | | | | | | | | | |
| Baboy, litsonin | 77.8 | 1.575 | | 1.21 | 12.21 | 228.71 | .82 | | .214 | .354 | 2.34 | |
| Baka | 77.1 | 1.727 | 10.44 | 1.35 | 10.74 | 224.46 | 1.86 | .2056 | .150 | .173 | 3.81 | 11.44 |
| Kalabaw | 77.2 | 1.504 | 10.12 | 1.38 | 13.69 | 253.82 | 3.96 | tr | .157 | .197 | 3.73 | 12.26 |
| Tupa | | 1.742 | | 1.31 | 11.07 | 187.84 | | tr | .191 | .306 | 3.26 | |

*Organ meats.*—The proximate composition of liver, kidney, heart and spleen of the different animals and the liver and gizzard of fowls and birds reported in this study was found to have essentially similar values as those of their respective muscle meats. The stomach, intestines, and pancreas have lower proximate values than the organ meats mentioned above.

Iron was found in good amounts in all livers studied, while the spleen, heart, and kidney contain only appreciable quantities of this mineral. Calcium and phosphorus are present in amounts comparable to that found in muscle meats. Of note is the higher amounts of calcium in "librilyo."

The thiamine contents of liver, kidney, and heart which average 0.4 mg per 100 gm are about twice the amount present in spleen, lungs, and brain. The riboflavin content of liver and kidney are higher than that of other organs.

Liver contains the highest niacin value—16 mg per 100 gm for lamb, rabbit, and turkey livers. Organ meats especially the liver, spleen, and kidney contain considerable amounts of vitamin C.

## SUMMARY

The proximate, mineral and vitamin contents of meat and organ meats of 7 animals, 9 poultry and fowls, and 2 others are reported. The nitrogen content of muscle meat does not vary widely with the different cuts of meat and among the different animals, poultry and fowls. Pork contains a high percentage of fat compared to other meat samples. The average mineral ash is 1 per cent. Meat samples found to be good sources for the vitamins are: pork for thiamine, goat meat for riboflavin, and rabbit and venison for niacin.

Among the organ meats, the liver, kidney, heart, spleen, and gizzard contain nitrogen in amounts comparable to muscle meat and have high value for vitamins and appreciable percentage for the mineral especially iron. The tongue, lungs, brain, pancreas, stomach, and intestines are found inferior in nutrient values to the above-mentioned organs.

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